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North Carolina Department of Transportation
Statewide Planning Branch
Small Urban Planning Unit

Thoroughfare Plan for the Town of Bladenboro

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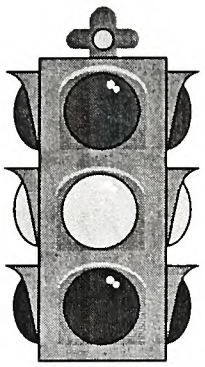


Town of Bladenboro Thoroughfare Plan

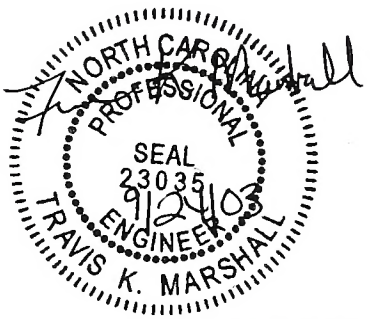
Prepared by the:

Statewide Planning Branch
Division of Highways
North Carolina Department of Transportation

In Cooperation With:

The Town of Bladenboro
The Federal Highway Administration
U.S. Department Of Transportation

January, 2000



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Executive Summary

This Plan documents the findings of a thoroughfare study for the Town of Bladenboro. Below is a listing and brief description of these findings:

Major Thoroughfares

1. **NC 131-242-410** – Construction on new location a two-lane facility from NC 242-410 at SR 1171 (Old Abbottsburg Road) to NC 211 Bypass west of SR 1100 (Village Street), for a total of approximately 2.4 miles. This new facility would reduce traffic on Main Street and Seaboard Street and will provide a continuous traffic flow. In anticipation of future widening, right-of-way should be reserved for a multi-lane facility.

2. **NC 131-410** – It is recommended that NC 131-410 be widened to a five-lane facility from the NC 211 Bypass to the northern planning area boundary. This area is a mixture of industrial, residential and commercial development and is expected to grow over the planning period. These improvements will reduce congestion in this area while spurring economic development.

3. **Railroad Street Extension** – It is recommended that Railroad Street be extended from Ash Street to NC 211 Business at SR 1100 (Village Street). This new facility would reduce traffic on Seaboard Street and provide an alternative parallel route to the commercial development.

Minor Thoroughfares

1. **New Connector** - It is recommended that a two-lane facility be constructed from West Bladen Street to Pine Ridge Circle, for a total project length of approximately 0.5 miles. This would allow access to the Pine Ridge area when the train is being load at the local site.

2. **Railroad Street Extension East** - It is recommended that Railroad Street be extended from Bladenboro Airport Road (SR 1133) to the existing East Railroad Street. The project length is approximately 0.9 miles.

Intersections Improvements

1. **Intersection of NC 211 Business (Seaboard Street) and NC 131-242-410 (Main Street):** It is recommended that the turning radii at this location be improved to allow the right turn movement to be made with out conflicting with on coming traffic on Main Street. This improvement would increase traffic flow in the central business district while reducing accidents and conflicts in this area.

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Chapter 1

Introduction

Thoroughfare Plan Development and Responsibility

This report documents the findings of a study by the North Carolina Department of Transportation (NCDOT) in the development of the 1999 Bladenboro Thoroughfare Plan. This study was initiated in December of 1996, in response to a request from local officials to consider the effects of traffic generated in and through the Town of Bladenboro over a thirty-year period. The study culminated in the mutual adoption of the Bladenboro Thoroughfare Plan. The geographic location of Bladenboro is shown in Figure 1 and the Bladenboro Thoroughfare Plan is given in Figure 2, dated February 8, 1999.

Thoroughfare planning enables a transportation system to be progressively developed to adequately meet the transportation needs of a community as land development and traffic volumes increase. Planning for future transportation needs prevents unnecessary costs and impacts to the physical, social, and economic environment. Thoroughfare plan studies are conducted based on the principles outlined in Appendix A.

The purpose of this study is to examine the present and future transportation needs of the Bladenboro area in order to develop a thoroughfare plan. The recommendations proposed herein are based on existing roadway conditions and projected growth for the urban area over a thirty-year planning period. Since actual growth rates and patterns may differ from those anticipated, it may become necessary to accelerate or retard the implementation of recommendations or to revise the proposals. It is therefore desirable to have the thoroughfare plan updated regularly in order to revise growth projections and amend the thoroughfare plan, as necessary. Further, a more detailed analysis will be conducted prior to construction of any project, to determine the specific location and design requirements.

The Town of Bladenboro and the NCDOT share responsibility for the proposed thoroughfare improvements. The mutually adopted Bladenboro Thoroughfare Plan serves as a guide for providing a coordinated, adequate, and economical major street system. For the planning efforts to be effective, the Town and the State must procure in advance or protect, by various legal means, the right-of-way needed for future roadway improvements. Since transportation needs throughout the state exceed available funding, local areas should aggressively pursue funding for desired projects.

Background

Bladenboro, located in southeastern North Carolina, is a small urban community in the southwestern portion of Bladen County. Bladenboro is also approximately 15 miles east of the City of Lumberton. The town is mostly residential, with some commercial development along the major thoroughfares that include NC 131, NC 211 Business, and NC 242-410.

Summary of Recommendations

The major recommendations of the 1999 Bladenboro Thoroughfare Plan are summarized below. Projects included in the 2002-2008 Transportation Improvement Program (TIP) are shown in parentheses. The Bladenboro Thoroughfare Plan is shown in Figure 2 and the Recommended Improvements are shown in Figure 3.

Recommended Intersection Improvements

Intersection of NC 211 Business (Seaboard Street) and NC 131-242-410 (Main Street)

Improve the turning radii from the NC 211 Business east approach to NC 131-242-410 heading north

New Connector

Construct on new location a connector from West Bladen Street to Pine Ridge Circle

NC 131-410

Widen roadway to a five lane facility from the planning area boundary to the NC 211 Bypass

NC 131-242-410 Bypass

Construct on new location a bypass facility from NC 410 to NC 211 Bypass

Railroad Street Extension

Construct an extension of Railroad Street from Ash Street to Old NC 211 at SR 1100 (Village Street)

Railroad Street East Extension

Extend Railroad Street from Bladenboro Airport Road (SR 1133) to the existing East Railroad Street

Report Layout

This report can be divided into five parts. The first part of the report, covered in Chapter 1, covers the highlights of the study. Chapter 2 and 3 provide a detailed description of the thoroughfare plan study recommendations and addresses different methods by which these recommendations can be implemented. The next chapter, Chapter 4, covers study procedures and findings. Chapters 5 and 6 provide a detailed description of population, land use and environmental concerns that were looked at while developing this plan. The final chapter, Chapter 7, covers traffic model development.

Information that will be especially useful to the practitioners is provided in the Appendices. The principles of thoroughfare planning are covered in Appendix A, a detailed tabulation of all routes on the thoroughfare plan and a graphical representation of typical cross-sections can be found in Appendix B and C, respectively. Information related to subdivision ordinances is covered in Appendix D. The planning area housing and employment data is shown in Appendix E. Finally, the Pedestrian Policy Guidelines and the Transportation Improvement Program (TIP) process are shown in Appendix F and G respectively.

GEOGRAPHIC LOCATION FOR BLADENBORO, NORTH CAROLINA

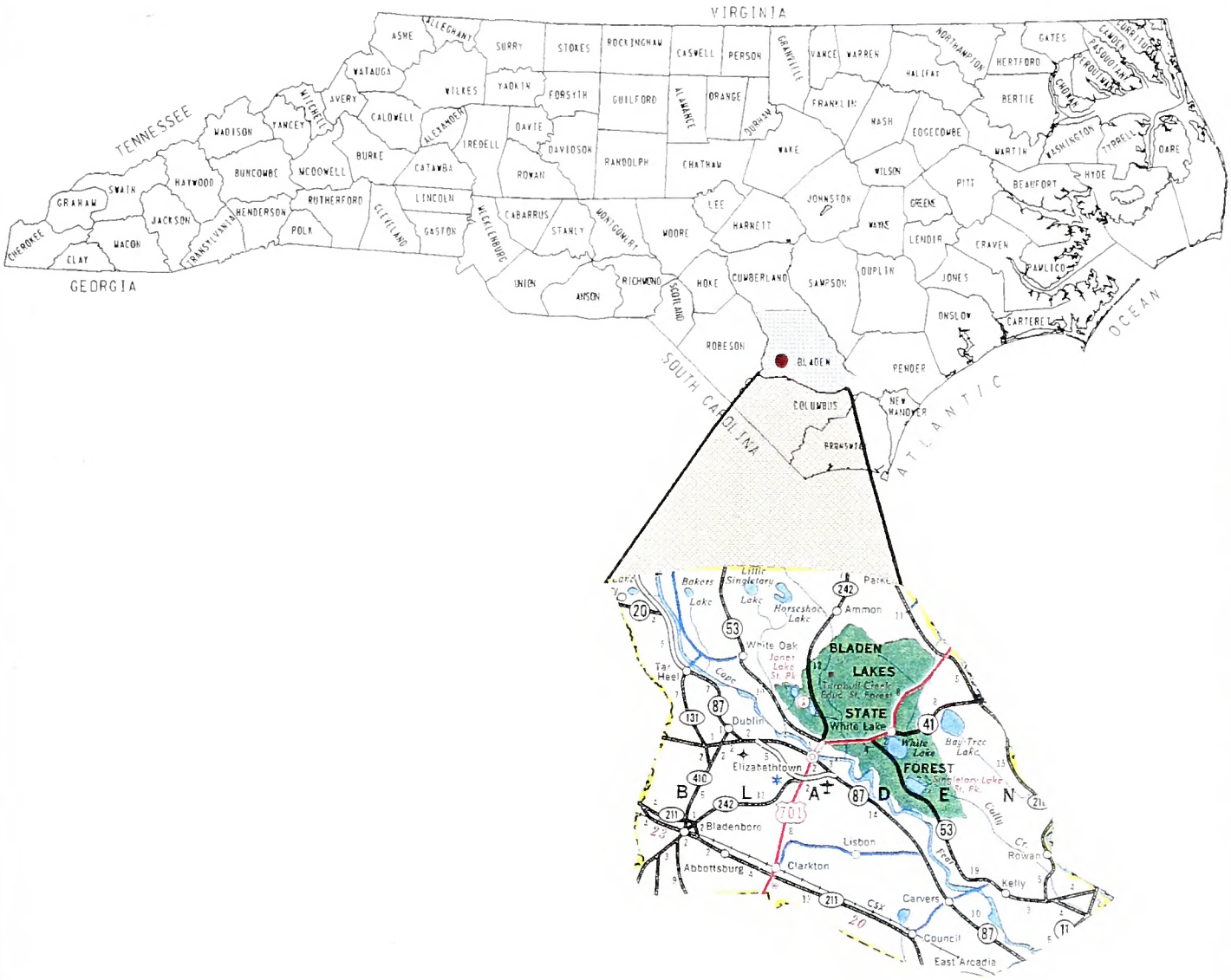

FIGURE 1

Chapter 2
Recommended Thoroughfare Plan

Intent of the Thoroughfare Plan

A thoroughfare plan study uncovers the need for new facilities, plus identifies existing and future deficiencies in the transportation system. The thoroughfare plan is a representation of the existing highway system by functional use, e.g., major thoroughfares, minor thoroughfares plus any new facilities that are needed (Refer to Figure 2 for Thoroughfare Plan map). The planning methodology enables identification of deficiencies in the existing system, allowing compilation of a list of needed improvements (Refer to Figure 3 for Recommendations map).

This chapter presents an analysis and makes recommendations based on the ability of the existing street system to serve the present and future travel desires as the area continues to grow. The usefulness of transportation planning is in the analysis of different highway configurations for their efficiency in serving the area. The recommended plan sets forth a system of thoroughfares to serve the anticipated traffic and land development needs for the Town of Bladenboro planning area. The need to eliminate existing and projected system deficiencies that cause traffic congestion is the primary objective of the plan.

The recommendations are based on the results of a traffic forecast model that uses data on traffic counts, population, housing, employment, and vehicle ownership to simulate travel patterns. With this model, each major street and highway in the planning area is analyzed to determine its ability to serve existing and future traffic demands.

Major Thoroughfares

Major thoroughfares are designed to provide for the expeditious movement of high volumes of traffic within and through urban areas. This system of thoroughfares includes interstates, other freeways, expressways, and parkways, as well as major streets. Listed below are the major thoroughfares, as designated in the 1999 Bladenboro Thoroughfare Plan.

- NC 131 – Whiteville Road
- NC 211 Bypass
- NC 211 Business – Seaboard Street
- NC 242 – Elizabethtown Road
- NC 410 – Main Street
- SR 1100 – Village Street
- SR 1117 – Storms Road
- SR 1120 – Butler Mill Road
- SR 1121 – Zion Hill Church Road
- SR 1132 – Ball Park Road
- SR 1134 – Burney Road
- SR 1171 – Old Abbottsburg Road
- SR 1176 – Forrest Drive
- SR 1177 – Galeed Church Road
- SR 1178 – Richardson Road
- SR 1179 – Bryant Swamp Road
- Proposed NC 131-242-410 Bypass
- Proposed Railroad Street Extension

Minor Thoroughfares

Minor thoroughfares function as collectors for traffic from local access streets to major thoroughfares. Minor thoroughfares supplement the major thoroughfare system by facilitating minor through traffic movements and by providing access to abutting property. The minor thoroughfares in the Bladenboro planning area are listed below.

- SR 1119 – Sunset Park Road
- SR 1120 – Butler Mill Road
- SR 1133 – Bladenboro Airport Road
- SR 1174 – S. Bladen Street
- SR 1175 – Fourth Street
- Pine Ridge Circle
- Railroad Street
- Railroad Street East Extension
- West Bladenboro Street
- New Connector

Thoroughfare Plan Recommendations

The process of developing and evaluating thoroughfare plan recommendations involves many considerations, including the goals and objectives of the area, identified roadway deficiencies, environmental impacts, existing and anticipated land development, and travel services. Refer to Chapter 7 for documentation of the analysis involved in developing the recommendations for the Town of Bladenboro planning area. A detailed description of the purpose and need for the recommended improvements that were cooperatively developed are given below. Refer to Figure 3 for a depiction of the thoroughfare plan recommendations.

Major Thoroughfares

NC 131-242-410 Bypass - Purpose and Need

- **Project Recommendation:** It is recommended that a two-lane facility be constructed from NC 242-410 at SR 1171 (Old Abbottsburg Road) to NC 211 Bypass west of SR 1100 (Village Street), for a total of approximately 2.4 miles. In anticipation of future widening, right-of-way should be reserved for a multi-lane facility.

- **Transportation Demand:** NC 131, NC 242 and NC 410 are all functionally classified as major collectors in the Bladenboro planning area. These routes primarily serve major intra-county travel corridors and traffic generators while providing access to the arterial system. This proposed facility is a north-south route in the western portion of the planning area. It would provide a bypass facility of the central business district and provide a western loop connector facility that would connect NC 131-410 to NC 211 business and NC 211 Bypass. The traffic accessing this facility would be both residential and through traffic. This new facility would also provide greater access and maneuverability to residents of Bladenboro while providing a better connection for through trips in Bladen County.

- **Roadway Capacity and Deficiencies:** The capacity of this proposed two-lane (on multi-lane right-of-way) bypass/connector is 12,500 vpd (vehicles per day). The projected average daily traffic of this facility is 2,800 vpd for the year 2025. Based on traffic growth projections, this facility is expected to be operating at level of service (LOS) A in the year

2025. The construction of this facility also lowers the traffic volumes on NC 131-410 and NC 242, thereby increasing the levels of service of these roadways.

- **Safety Issues:** If this facility is not constructed, increasing traffic will result in the potential for increased accident rates in the central business district along NC 131-410, NC 211 business, and NC 242. The bypass/connector will reduce the inter mixing of local traffic and through traffic. A bypass of Bladenboro is more beneficial than widening existing NC 131-410 in these areas, in part due to the disruption and high cost that would be incurred in relocating businesses along the facility. However, the proposed facility will provide increased capacity, greater maneuverability, and more control of access, resulting in safer driving conditions. In addition, a bypass will provide improved safety by controlling driveway access points.

- **Social Demands and Economic Development:** This facility would carry traffic north-south just west of the central business district. Proposed development is projected to be just west of this facility along NC 211 Business. With the proposed industrial park along the existing NC 131-410 in the northern planning area, this connector would help alleviate traffic on NC 131-410 through the planning area. The anticipated future development in this area has the potential to increase substantially over the planning period. This proposed facility, in addition to accommodating the expected traffic increase, may also help to accommodate the anticipated spur in economic development.

- **System Linkage:** Implementing a bypass of NC 131-242-410 is imperative because of its significance in serving intercounty travel and providing a connection between cities and larger towns. For the very same reason, it is important that the highway is kept in good operating condition. Further, this facility plays a valuable role in providing continuous north-south travel across the county.

- **Relationship to Other Plans:** This facility is not directly connected to any other thoroughfare plan.

NC 131-410 - Purpose and Need

- **Project Recommendation:** It is recommended that NC 131-410 be widened to a five-lane facility from the NC 211 Bypass to the northern planning area boundary. The project length is approximately 1.22 miles.

- **Transportation Demand:** NC 131-410 is functionally classified as a major collector, which primarily serves intra-county travel and local traffic generators in addition to providing access to the arterial system. This facility serves both residential and industrial traffic. The industrial park is located in this area and this facility is the north-south route that connects to the central business district.

- **Roadway Capacity and Deficiencies:** The current average daily traffic on this facility is 4,600 vpd. The capacity of the existing roadway is 12,200 vpd. The projected average daily traffic is 9,300 vpd will result in this portion of NC 131-410 being near capacity by the year 2025. NC 131-410 is currently operating at level of service (LOS) B and, without any improvements will be at LOS C by the year 2025, based on traffic growth projections. The proposed cross section, a multi-lane facility, will provide a capacity of approximately 28,000 vpd and will improve the level of service to A.

- **Safety Issues:** If no improvements are made to this facility, increasing traffic congestion will result in the potential for increased accident rates. However, the recommended improvements to NC 131-410 will provide increased capacity, greater maneuverability, and more control of access, resulting in safer driving conditions.

- **Social Demands and Economic Development:** The main social demand in this area is the industrial park with some residential development. There is potential for both residential and industrial development in this area during the planning period. This facility carries traffic north-south into the central business district. This improvement to this facility, in addition to accommodating the expected traffic increase, may also help to accommodate the anticipated spur in economic development.

- **System Linkage:** Because of the significance of NC 131-410 in the planning area and in Bladen County, it is important that the highway is kept in good operating condition.

- **Relationship to Other Plans:** This facility is not directly connected to any other thoroughfare plan.

Railroad Street Extension - Purpose and Need

- **Project Recommendation:** It is recommended that Railroad Street be extended from Ash Street to NC 211 Business at SR 1100 (Village Street). The project length is approximately 0.6 miles.

- **Transportation Demand:** Railroad Street is not functionally classified, and serves primarily local traffic. There is some commercial development along the existing facility today and this facility primarily serves that development. In the future, this facility will serve both residential and industrial traffic.

- **Roadway Capacity and Deficiencies:** The capacity of this proposed connector is 12,500 vpd. Although the projected average daily traffic on this facility is 4,000 vpd for the year 2025, the construction of this facility provides an alternate route and convenient access to the commercial development. This facility would also be instrumental in increasing the capacities and levels of service on Seaboard Street.

- **Safety Issues:** If this facility is not constructed, increased traffic will result in the potential for increased accident rates within the Town of Bladenboro. However, the proposed facility will provide increased capacity, greater maneuverability, and more control of access, resulting in safer driving conditions.

- **Social Demands and Economic Development:** This facility would carry traffic east-west just south of the central business district. By having a better connection between the residential area and the commercial area, future development is anticipated. This proposed facility, in addition to accommodating the expected traffic increase, may also help to accommodate the anticipated spur in economic development.

- **System Linkage:** The proposed connector plays a significant role in the street system within the Town of Bladenboro, serving as an alternate route for Seaboard Street. This would allow Seaboard Street to serve traffic that is trying to access businesses in this area and help the movement of traffic through the central business district. The new facility would allow for improved access to NC 211 Business and the commercial development in

that area. Because of the significance of Seaboard Street in the planning area, it is important that this highway is kept in good operating condition.

- **Relationship to Other Plans:** This facility is not directly connected to any other thoroughfare plan.

Minor Thoroughfares

New Connector - Purpose and Need

- **Project Recommendation:** It is recommended that a two-lane facility be constructed from West Bladen Street to Pine Ridge Circle, for a total project length of approximately 0.5 miles.

- **Transportation Demand:** West Bladen Street and Pine Ridge Circle are not classified as a part of the state functional classification system but East Bladen Street is classified as a minor collector. When this connector is built, this facility would be classified as a minor collector and would connect the south eastern planning area to the western planning area. The proposed connector would connect NC 131-242-410 (Main Street) to NC 211 Business (Seaboard Street) and would alleviate some traffic at the intersection of Main Street and Seaboard Street. The traffic accessing this area is primary residential. This will also help with access to the Pine Ridge area when the train is waiting to be loaded on the main entranceway. This new facility would also provide greater access and maneuverability to residents of Bladenboro.

- **Roadway Capacity and Deficiencies:** The capacity of this proposed two-lane connector is 12,500 vpd (vehicles per day). The projected average daily traffic of this facility is 1,000 vpd for the year 2025. Based on traffic growth projections, this facility is expected to be operating at level of service (LOS) A in the year 2025. The construction of this facility also lowers the traffic volumes on Seaboard Street and Main Street, thereby increasing the levels of service of these roadways.

- **Safety Issues:** The main concern of the Town is that when the train is loading, there is no access to the Pine Ridge area. The thought was that if there was an emergency in this area, time would be lost because the train would have to be moved before access could be gained. This facility will also reduce traffic on Main Street and Seaboard Street, which will reduce accident rates and traffic congestion.

- **Social Demands and Economic Development:** With this new connection it would provide continuous movement from the residential area of Bladenboro to the central business district while avoiding the heavily traveled intersection of Seaboard and Main Streets. The anticipated future development in this area is limited because of Bryant Swamp, but this facility will promote some growth in the south-eastern and western portions of the planning area.

- **System Linkage:** The proposed connector plays a significant role in the street system within the Town of Bladenboro, serving as an alternate route for Seaboard Street and Main Street. This would allow Main and Seaboard Street to serve traffic that is trying to access businesses in this area. This connector facility would connect the south eastern planning area to the western planning area and allow for improved access to NC 211 Business and

the western planning area. Because of the significance of Seaboard and Main Streets in the planning area, it is important that those highways are kept in good operating condition.

- **Relationship to Other Plans:** This facility is not directly connected to any other thoroughfare plan.

Railroad Street East Extension - Purpose and Need

- **Project Recommendation:** It is recommended that Railroad Street be extended from Bladenboro Airport Road (SR 1133) to the existing East Railroad Street. The project length is approximately 0.9 miles.

- **Transportation Demand:** Railroad Street is not functionally classified, and serves primarily local traffic. There is some commercial and industrial development along the existing facility today and this facility primarily serves that development. In the future, this facility serves primarily commercial and industrial traffic.

- **Roadway Capacity and Deficiencies:** The capacity of this proposed connector is 12,500 vpd. Although the projected average daily traffic on this facility is 2,200 vpd for the year 2025, the construction of this facility provides an alternate route and convenient access to the commercial development. This facility would also be instrumental in increasing the capacities and levels of service on Seaboard Street.

- **Safety Issues:** If this facility is not constructed, increased traffic will result in the potential for increased accident rates within the Town of Bladenboro. However, the proposed facility will provide increased capacity, greater maneuverability, and more control of access, resulting in safer driving conditions.

- **Social Demands and Economic Development:** This facility would carry traffic east-west just south of the central business district. By having a better connection between the residential area and the commercial area, future development is anticipated. This proposed facility, in addition to accommodating the expected traffic increase, may also help to accommodate the anticipated spur in economic development.

- **System Linkage:** The proposed connector plays a significant role in the street system within the Town of Bladenboro, serving as an alternate route for Seaboard Street. This would allow Seaboard Street to serve traffic that is trying to access businesses in this area and help the movement of traffic through the central business district. The new facility would allow for improved access to NC 211 Business and the commercial development in that area. Because of the significance of Seaboard Street in the planning area, it is important that this highway is kept in good operating condition.

- **Relationship to Other Plans:** This facility is not directly connected to any other thoroughfare plan.

Intersection Improvements

The following intersection is recommended for safety improvements.

- **Intersection of NC 211 Business (Seaboard Street) and NC 131-242-410 (Main Street):** It is recommended that the turning radii be improved from the Seaboard east approach to Main Street heading north. The turning radius is to short for tractor trailer traffic to make this turn without turning into oncoming traffic. It was noted from local input and observed that it was difficult if not impossible for tractor trailers to converse this intersection. The tractor trailer would have to backing up or the oncoming traffic would have to go through the red light or they had to back up to accommodate this move. By making this improvement, it would improve the flow of traffic in the central business district and reduce accidents occurring at this intersection. With this recommended improvement it would also improve the sight distance at the intersection due to the fact that the building in this quad would need to be removed, therefore improving the sight angles. This improvement will provide increased capacity, greater maneuverability, and more control of access, resulting in safer driving conditions.

Bicycle Routes

In the Bladenboro planning area there are no highways designated as statewide bicycle routes by the NCDOT Division of Bicycle and Pedestrian Transportation. However, Bladen County has two State designated bike routes which are the Cape Fear Run and the Sandhills Sector. Because of these bike route facilities, careful consideration should be done when looking at other facilities in the area for bicycle traffic.

When considering the widening of these facilities, the NCDOT Division of Bicycle and Pedestrian Transportation should be consulted. This division can recommend the most appropriate cross section for the widening, in addition to providing assistance in identifying the need for improvements based on present and future bicycle traffic. For further consideration and assistance, the coordinator of this division can be contacted at the address below.

NC Department of Transportation
Division of Bicycle and Pedestrian Transportation
1552 Mail Service Center
Raleigh, NC 27699-1552

Public Involvement

Based on a request from the Bladenboro Town Council, the study to develop a thoroughfare plan for Town of Bladenboro was officially started in November of 1996. NCDOT officials met with the Bladenboro Board of Commissioners and Planning Board on November 18, 1996. This meeting was held to present information on the thoroughfare planning process and to gather input on the transportation needs of the town.

On December 7, 1998, the Bladenboro Town Planning Board was given a presentation on the development, the proposed projects, and the recommendations for the Bladenboro Thoroughfare Plan. This information was finalized and recommended to the Town Planning Board at the January 4, 1999 planning board meeting. The proposed thoroughfare plan was presented at the February 8, 1999 Bladenboro Town Commissioners' meeting, with members of the public present. After a public hearing, the Commissioners unanimously adopted the 1999 Bladenboro Thoroughfare Plan.

N. C. Board of Transportation

The 1999 Bladenboro thoroughfare plan was adopted by the North Carolina Board of Transportation on April 9, 1999.

BLADENBORO THOROUGHFARE PLAN

LEGEND

	EXISTING	PROPOSED
MAJOR THOROUGHFARES	———	·····
MINOR THOROUGHFARES	———	- - - -
INTERCHANGE	●	◉

ADOPTED BY:

TOWN OF BLADENBORO	2-08-99
RECOMMENDED BY STATEWIDE PLANNING	2-26-99
N.C. DEPARTMENT OF TRANSPORTATION	4-09-99

N

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BLADENBORO

NORTH CAROLINA

PREPARED BY THE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS – STATEWIDE PLANNING BRANCH

IN COOPERATION WITH THE

UNITED STATES DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

SCALE

0 1000 2000 4000 FEET

Figure 2

BASE MAP 12-10-98

PRELIMINARY RECOMMENDATIONS

LEGEND

- Construct on New Location
- Widen to Multi-Lane Facility
- Intersection Improvements

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BLADENBORO

NORTH CAROLINA

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS – STATEWIDE PLANNING BRANCH

IN COOPERATION WITH THE

UNITED STATES DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

SCALE

0 1000 2000 4000 FEET

FIGURE 3

Chapter 3

Implementation of the Thoroughfare Plan

Once the thoroughfare plan has been developed and adopted, implementation is one of the most important aspects of the transportation plan. Unless implementation is an integral part of this process, the effort and expense associated with developing the plan is lost. There are several tools available for use by the Town of Bladenboro to assist in the implementation of the thoroughfare plan. They are described in detail in this chapter.

State-Municipal Adoption of the Thoroughfare Plan

The Town of Bladenboro and the North Carolina Department of Transportation have mutually approved the thoroughfare plan shown in Figure 2. This mutually approved plan serves as a guide for the Department of Transportation in the development of the road and highway system for Bladenboro. The approval of the plan by the Town enables standard road regulations and land use controls to be used effectively in the implementation of this plan. As a part of the plan, the Town and Department of Transportation shall reach agreement on the responsibilities for existing and proposed streets and highways. Facilities that are designated as State responsibility will be constructed and maintained by the Division of Highways. Facilities that are designated as municipal responsibility will be constructed and maintained by the municipality.

Subdivision Controls

Subdivision regulations require every subdivider to submit to the Town Planning Board a plan of any proposed subdivision. It also requires that subdivisions be constructed to certain standards. Through this process, it is possible to require the subdivision streets to conform to the thoroughfare plan and to reserve or protect necessary right-of-way for projected roads and highways that are to become a part of the thoroughfare plan. The construction of subdivision streets to adequate standards reduces maintenance costs and simplifies the transfer of streets to the State Highway System. Appendix D outlines the recommended subdivision design standards as they pertain to road construction.

Land Use Controls

Land use regulations are an important tool in that they regulate future land development and minimize undesirable development along roads and highways. The land use regulatory system can improve highway safety by requiring sufficient setbacks to provide for adequate sight distances and by requiring off-street parking.

Development Reviews

Development access to a state-maintained street or highway is reviewed by the District Engineer's Office and by the Traffic Engineering Branch of the North Carolina Department of Transportation. In addition, any development expected to generate large volumes of traffic (e.g., shopping centers, fast food restaurants, or large industries) may be comprehensively studied by staff from the Traffic Engineering Branch, Project Development and Environmental Analysis Branch, and/or Roadway Design Unit of NCDOT. If done at an early stage, it is often possible to significantly improve the development's accessibility while preserving the integrity of the thoroughfare plan.

Funding Sources

Capital Improvements Program

A capital improvement program makes it easier to build a planned thoroughfare system. It consists of two lists of projects. The first is a list of highway projects that are designated as a municipal responsibility and are to be implemented with municipal funds. The second is a list of local projects designated as State responsibility to be included in the Transportation Improvement Program.

Transportation Improvement Program

North Carolina's Transportation Improvement Program (TIP) is a document that lists all major transportation projects, and their funding sources, planned by the NCDOT for a seven-year period. Every two years, when the TIP is updated, completed projects are removed, programmed projects are advanced, and new projects are added.

During biannual TIP public hearings, municipalities, local citizens groups, and other interested parties request projects to be included in the TIP. The group requesting a particular project(s) should submit to the NCDOT Board of Transportation Member representing their area the following: a letter with a prioritized summary of requested projects, TIP candidate project request forms, and project location maps with a description of each project. Refer to Appendix G for an example of a TIP project request packet. The Board of Transportation reviews all of the project requests from each area of the state. Based on the technical feasibility, need, and available funding, the board decides which projects will be included in the TIP. In addition to highway construction and widening, TIP funds are available for bridge replacement, highway safety projects, public transit projects, railroad projects and bicycle facilities.

Industrial Access Funds

If an industry wishes to develop property that does not have access to a state maintained highway and certain economic conditions are met, then funds may be made available for construction of an access road.

Small Urban Funds

Small Urban funds are annual discretionary funds made to municipalities with qualifying projects. The maximum amount is $1,000,000 per year per division. A city/town may have multiple projects. Requests for Small Urban Fund assistance should be directed to the appropriate Board of Transportation member and Division Engineer.

The North Carolina Highway Trust Fund Law

The Highway Trust Fund Law was established in 1989 as a plan with four major goals for North Carolina's roads and highways. These goals are:

1. To complete the remaining 1,716 miles of four lane construction on the 3,600 mile North Carolina Intrastate System.

2. To construct a multilane connector in Asheville and portions of multilane loops in Charlotte, Durham, Greensboro, Raleigh, Wilmington, and Winston-Salem.

3. To supplement the secondary roads appropriation in order to pave, by 1999, 10,000 miles of unpaved secondary roads carrying 50 or more vehicles per day, and all other unpaved secondary roads by 2006.

4. To supplement the Powell Bill Program.

The portion of this bill which will benefit Bladenboro, over the thirty year planning period, is the paving of most, if not all, of its unpaved roads on the State maintained system. Also, there will be an increase in Bladenboro Powell Bill Funds if these newly paved roads are in the Bladenboro Corporate Limits. For more information on the Highway Trust Fund Law, contact the Program Development Branch of the North Carolina Department of Transportation.

Implementation Recommendations

The following table provides a break down of the projects recommended in the Bladenboro Thoroughfare Plan and the corresponding funding source that would best suit the implementation of the given project.

Table 1

Funding Sources and Methods Recommended for Implementation of Projects

	Funding Sources				Methods of Implementation			
Projects	Local Funds	TIP Funds	Indust. Access	Small Urban	T-fare Plan	Subdiv. Ord.	Zoning Ord.	Develop. Review
Intersection Improvements	X			X	X			X
New Connector	X				X	X	X	
NC 131-410		X			X		X	X
NC 131-242-410 Bypass		X			X	X	X	
Railroad Street Extensions				X	X	X	X	X

❖ Intersection Improvements are recommended for the intersection of Seaboard Street (NC 211Business) and Main Street (NC 131-242-410).

Construction Priorities and Cost Estimates

Construction priorities will vary depending on what criteria are considered and what weight is attached to the various criteria. Most people would agree that improvements to the major thoroughfare system and major traffic routes would be more important than minor thoroughfares where traffic volumes are lower. To be in the North Carolina Transportation Improvement Program, a project must show favorable benefits relative to costs and should not be prohibitively disruptive to the environment. The length of the project, the potential for economic development and the environmental impacts of five recommended Bladenboro projects are given in Table 3. A guide to this table is shown in Table 2.

Table 2

Probability Estimation Guide

Subjective Evaluation	Impact Probability
Excellent - very substantial	1.00
Very good - substantial	0.75
Good - considerable	0.50
Fair - some	0.25
Poor - none	0.00

Reduced road user cost should result from any roadway improvement, from a simple widening to the construction of a new roadway. Roadway improvements should also relieve congested or unsafe conditions. Comparisons of the existing and the proposed facilities have been made in terms of vehicle operating costs, travel time costs, and accident costs. The user benefits are total dollar saving over the design period using data such as project length, base year and design year traffic volumes, traffic speed, type of facility, and volume capacity ratio.

The impact of a project on economic development potential is shown as the probability that it will stimulate the economic development of an area by providing access to developable land and reducing transportation costs. It is a subjective estimate based on the knowledge of the proposed project, local development characteristics, and land development potential. The probability is rated on a scale from 0 (representing no development potential) to 1.00 (representing excellent development potential).

The environmental impact analysis considers the effect of a project on the physical, social/cultural, and economic environment. Listed below are the thirteen items that are considered when evaluating the impacts on the environment:

* air quality
* water resources
* soils and geology
* wildlife
* vegetation
* neighborhoods noise
* noise
* educational facilities
* churches
* parks and recreational facilities
* historic sites and landmarks
* public health and safety
* aesthetics

The environmental impact analysis also uses a probability rating from 0 (representing no benefit to the environment) to 1.00 (representing a positive impact to the environment.) A negative value is assigned to the probability to indicate a negative impact. The summation of both positive and negative impact probabilities with respect to these factors provides a measure of the relative environmental impacts of a project. Table 2 shows the probability scale used in the analysis. This table can be used as a guideline for interpreting the "Economic Development" and Environmental Impact" values given in Table 3.

Table 3

Evaluation for Major Projects

Projects	Length (miles)	Economic Development	Environment Impact
Intersection Improvements	0	.25	.23
New Connector	0.50	.25	.23
NC 131-410	1.23	.50	.15
NC 131-242-410 Bypass	2.40	.25	.08
Railroad Street Extension	0.61	.25	.08

❖ Intersection Improvements are recommended for the intersection of Seaboard Street (NC 211Business) and Main Street (NC 131-242-410).

Offsetting the benefits that would be derived from any project is the cost of its construction. A new facility, despite its high projected benefits, might prove to be unjustified due to the excessive costs involved in construction. The highway costs for these projects will be based on the average statewide construction costs for similar project types. The anticipated right-of-way costs will also be included as an average cost per acre for property throughout the Bladenboro Planning Area according to the respective project. Table 4 provides an environmental analysis for major projects proposed in the thoroughfare plan.

Table 4

Environment Analysis for Major Projects

Project Description	Intersection Improvements	New Connector	NC 131-410	NC 131-242-410 Bypass	Railroad Street Extension
Category					
Cross Section	2-lanes	2-lanes	4-lanes	2-lanes	2-lanes
Length (miles)	0	0.28	1.23	2.50	0.61
Wetlands Impacts (acres)	0	0	0	0	0
Flood Plain (acres)	0	0	0	0	0
Protected Watershed	0	0	0	0	0
Critical Watershed	0	0	0	0	0
High Quality Water Zones	0	0	0	0	0
Nurseries/Spawning Areas	0	0	0	0	0
Hydrologic Crossings					
Normal	0	1	1	1	1
Trout	0	0	0	0	0
Critical Habitats					
Special Natural Areas (acres)	0	0	0	0	0
Nat. Heritage Occurrences	0	0	0	0	0
Historic Sites	0	0	0	0	0
Historic Districts	0	0	0	0	0
Cultural Resources					
Schools	0	0	0	0	0
Parks	0	0	0	0	0
Churches	0	0	0	0	0
Cemeteries	0	0	0	0	0
Community Facilities	0	0	0	0	0
Superfund Sites	0	0	0	0	0
Landfills	0	0	0	0	0
Groundwater Incidents	0	0	0	0	0
NPDES Discharges	0	1	0	0	0
Non-discharge Systems	0	0	0	0	0

Chapter 4

Analysis Town of Bladenboro's Roadway System

This chapter presents an analysis of the ability of the existing street system to serve the area's travel desires. Emphasis is placed not only on detecting the deficiencies, but also on understanding their cause. Travel deficiencies may be localized and the result of substandard highway design, inadequate pavement width, or intersection controls. Alternately, the underlying problem may be caused by a system deficiency such as a need for a bypass, loop facility, construction of missing links, or additional radials.

Existing Travel Patterns

An analysis of the roadway system must first look at existing travel patterns and identify existing deficiencies. This includes roadway capacity and safety analysis. Also in an urban area, a street's ability to move traffic is generally controlled by the spacing of major intersections, access control, width of pavement, and the traffic control devices (such as signals) utilized.

After the existing picture of travel in the area has been developed, the engineer must analyze factors that will impact the future system. These factors include forecasted population growth, economic development potential, and land use trends. This information will be used to determine future deficiencies in the transportation system.

Capacity Analysis of the Existing System

An indication of the adequacy of the existing street system is a comparison of traffic volumes versus the ability of the streets to move traffic freely at a desirable speed. The ability of a street to move traffic freely, safely, and efficiently with a minimum delay is controlled primarily by the spacing of major devices utilized. Thus, the ability of a street to move traffic can be increased by restricting parking and turning movements, using proper sign and signal devices, and by the application of other traffic engineering strategies.

Capacity is the maximum number of vehicles which has a "reasonable expectation" of passing over a given section of a roadway, during a given time period under prevailing roadway and traffic conditions. The relationship of traffic volumes to the capacity of the roadway will determine the level of service (LOS) being provided. Six levels of service have been selected for analysis purposes. They are given letter designations from A to F with LOS A representing the best operating conditions and LOS F the worst.

The six levels of service are illustrated in Figure 4, and they are defined on the following pages. The definitions are general and conceptual in nature, but may be applied to urban arterial levels of service. Levels of service for interrupted flow facilities vary widely in terms of both the user's perception of service quality and the operational variables used to describe them. The 1995 Highway Capacity Manual contains detailed descriptions of the levels of service as defined for each facility type.

Level of Service

LOS A

Describes primarily free flow conditions. The motorist experiences a high level of physical and psychological comfort. The effects of minor incidents of breakdown are easily absorbed. Even at the maximum density, the average spacing between vehicles is about 528 ft, or 26 car lengths.

LOS B

Represents reasonably free flow conditions. The ability to maneuver within the traffic stream is only slightly restricted. The lowest average spacing between vehicles is about 330 ft, or 18 car lengths.

LOS C

Provides for stable operations, but flows approach the range in which small increases will cause substantial deterioration in service. Freedom to maneuver is noticeably restricted. Minor incidents may still be absorbed, but the local decline in service will be great. Queues may be expected to form behind any significant blockage. Minimum average spacings are in the range of 220 ft, or 11 car lengths.

LOS D

Borders on unstable flow. Density begins to deteriorate somewhat more quickly with increasing flow. Small increases in flow can cause substantial deterioration in service. Freedom to maneuver is severely limited, and the driver experiences drastically reduced comfort levels. Minor incidents can be expected to create substantial queuing. At the limit, vehicles are spaced at about 165 ft, or 9 car lengths.

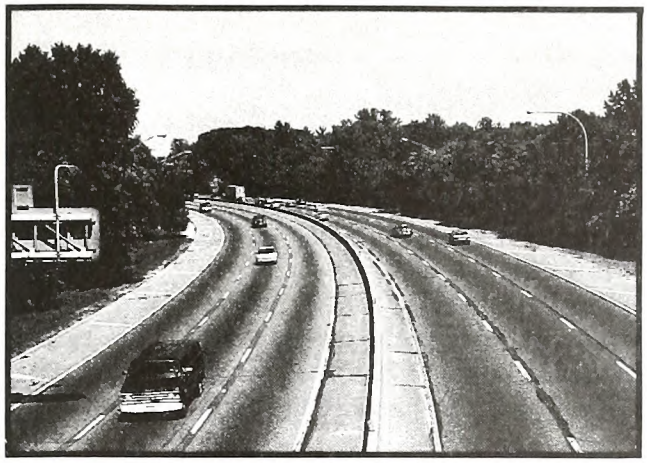
LOS E

Describes operation at capacity. Operations at this level are extremely unstable, because there are virtually no usable gaps in the traffic stream. Any disruption to the traffic stream, such as a vehicle entering from a ramp, or changing lanes, requires the following vehicles to give way to admit the vehicle. This can establishes a disruption wave that propagates through the upstream traffic flow. At capacity, the traffic stream has no ability to dissipate any disruption. Any incident can be expected to produce a serious breakdown with extensive queuing. Vehicles are spaced at approximately six car lengths, leaving little room to maneuver.

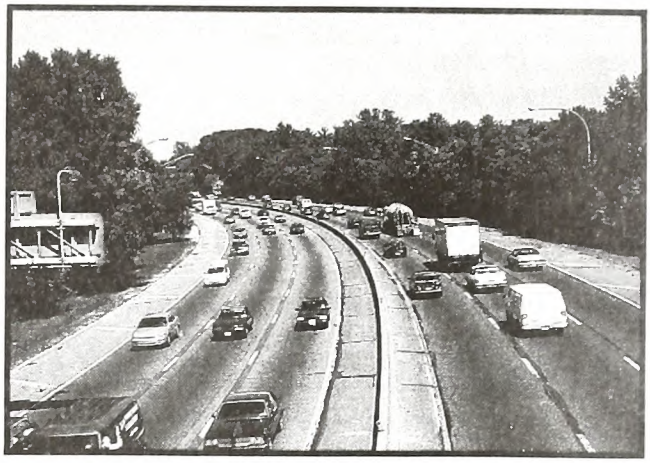
LOS F

Describes forced or breakdown flow. Such conditions generally exist within queues forming behind breakdown points.

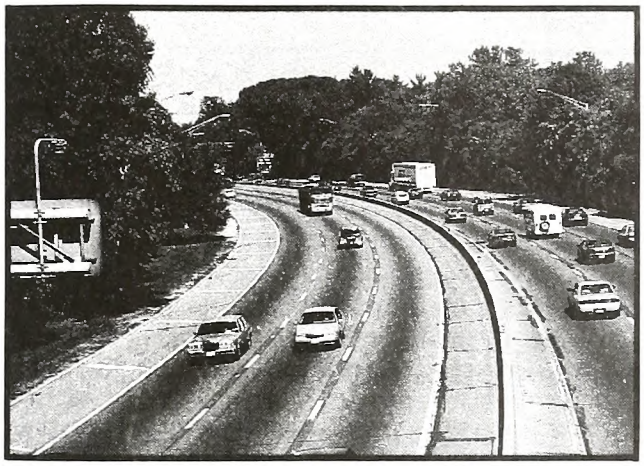
Source: 1994 Highway Capacity Manual



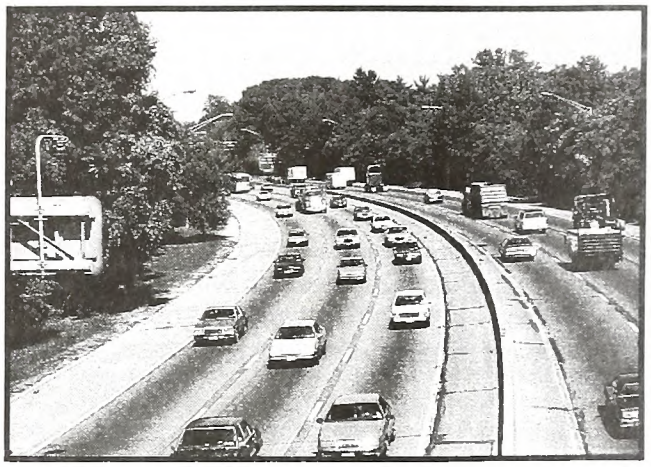
LOS A.



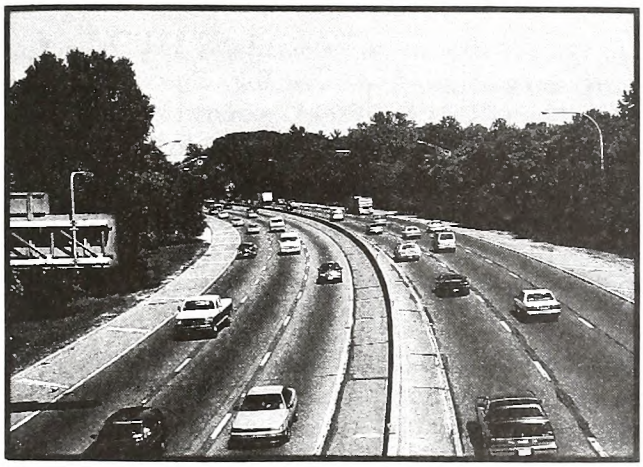
LOS D.



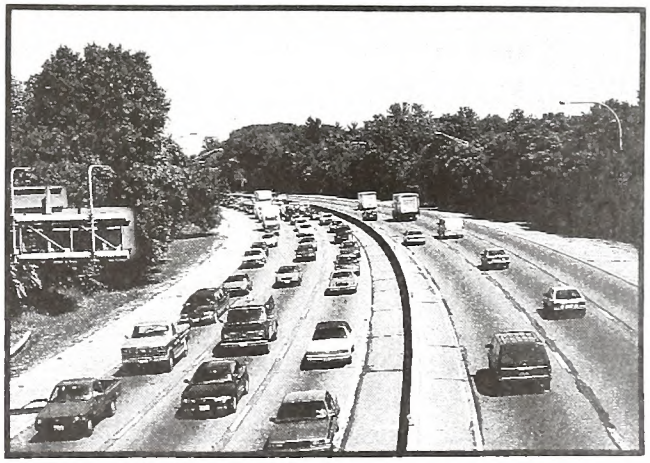
LOS B.



LOS E.



LOS C.



LOS F.

LEVELS OF SERVICE

FIGURE 4

Traffic Accidents

Traffic accidents are often used as an indicator for locating congestion problems. Traffic accident records can also be reviewed to identify problem locations or deficiencies such as poor design, inadequate signing, ineffective parking, or poor sight distance. Accident patterns developed from analysis of accident data can lead to improvements that will reduce the number of accidents.

Table 6 is a summary of the accidents occurring in Bladenboro between April 1996 and March 1999. This table only includes locations with 10 or more accidents. The "Total" column indicates the total number of accidents reported within 200 ft of the intersection during the study period indicated. The severity listed is the average accident severity for that location.

Table 5

Location with 10 or More Accidents in a 3-Year Period

Locations	Angle	Rear End	Ran Off Road	Left Turn	Right Turn	Other	Total	Severity
NC 211/ NC 242	14		1			1	16	15.10

Both the severity and number of accidents should be considered when investigating accident data. The severity of every accident is measured with a series of weighting factors developed by NCDOT's Division of Highways. In terms of these factors, a fatal or incapacitating accident is 47.7 times more severe than one involving only property damage, and an accident resulting in minor injury is 11.8 times more severe than one with only property damage. To request a more detailed accident analysis for any of the above mentioned intersections, or other intersection of concern, the Town should contact the Division 6 Traffic Engineer.

1996 Traffic Capacity Analysis

Capacity Deficiencies - Figure 5 depicts the base year (1996) major street system, and the ADT (Average Daily Traffic). A comparison of the base year ADT to capacities reveals that sections of the NC 211 Business corridor, in the central business district, are near or over practical capacity (LOS D).

- **NC 211 Business** - The current average daily traffic (ADT) on NC 211 Business varies between 3,000 and 8,600 vehicles per day (vpd). The capacities of the existing roadway ranges between 7,000 and 12,200 vpd. The section of NC 211 Business between Butler's Mill Road (SR 1120) and Pine Ridge Circle is near to over capacity. By the year 2025, if no improvements are made to the existing system, the NC 211 Business corridor will continue to deteriorate and congestion will expand along this facility.

- **NC 131-410** – The 1996 average daily traffic on the northern portion of NC 131-410 ranges from 3,900 to 8,500 vpd. The southern portion of the route has an ADT volume of 8,200 vpd. The facility has an average capacity of 12,200 vpd. It is projected in 2025 that the northern section of this facility will carry between 7,000 to 14,200 vpd. Without improvements this NC 131-410 in the planning area will be operating at near to over capacity.

No Build Alternative - Not implementing a thoroughfare plan or elements of it could be called a No-Build Alternative. This means that there would be no new construction or roadway improvements to the Bladenboro Thoroughfare system, except for routine maintenance. If no improvements are made to NC 211 Business, and NC 131-410 during the planning period, the increased traffic volumes and normal growth will result in a dramatic reduction in transportation quality. The LOS on sections of these facilities will drop to LOS E while other sections will approach LOS E. At LOS E the operating speed will drop significantly, and the queues of traffic currently experienced behind slow moving vehicles will get considerably longer. The absence of improvements will negatively impact growth and business in the Bladenboro area. Figure 6 shows the existing system assuming that no improvements are made by the design year.

AVERAGE DAILY TRAFFIC

LEGEND

- 1996 ADT Counts / Capacity
- Location
- Near Capacity
- Over capacity

N

S

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PREPARED BY THE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS – STATEWIDE PLANNING BRANCH

IN COOPERATION WITH THE

UNITED STATES DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

SCALE

0 1000 2000 4000 FEET

FIGURE 5

BASE MAP : 12-01-96

2025 AVERAGE DAILY TRAFFIC

LEGEND

- 2025 ADT Counts / Capacity
- Location
- Near capacity
- Over capacity

N

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SCALE

0 1000 2000 4000 FEET

FIGURE 6

BASE MAP 12-10-96

Chapter 5

Population, Land Use, and Traffic

Factors Affecting the Future Roadway System

The objective of thoroughfare planning is to develop a transportation system that will meet future travel demand and enable people and goods to travel safely and economically. To determine the needs of an area it is important to understand the role of population, economics, and land use have on the highway system. Examination of these factors helps to explain historic travel patterns and lays the groundwork for thoroughfare planning.

In order to formulate an adequate year 2025 thoroughfare plan, reliable forecasts of future travel characteristics must be achieved. The factors of population, vehicle usage trends, economy and land use play a significant role in determining the transportation needs of the area, and must be carefully analyzed. Additional items may include the effects of legal controls such as subdivision regulations and zoning ordinances, availability of public utilities and physical features of the area.

The first step in the development of the thoroughfare plan is to define the planning period and the planning area. The planning period is typically on the order of 30 years. The base year for the Bladenboro study was 1996, and the year 2025 was chosen to be the end point of the study period (29 years). The planning area is generally the limits to which urbanization is expected to occur during the planning period. The planning area is then subdivided into traffic analysis zones. Figure 7 shows the planning area boundary and zones.

Population

The amount of traffic on a section of roadway is a function of the size and location of the population which it serves. Investigating past trends in population growth and forecasting future population growth and dispersion is one of the first steps for a transportation planner. Table 6 shows the historical and projected population trends for Bladenboro through 2025. A graphical illustration of the population is shown in Figure 8.

Table 6

Population Trends and Projections

Year	Bladenboro	Bladen County	Township
1970	783	26,477	5,239
1980	1,428	30,491	4,947
1990	1,821	28,663	5,428
1996	1,977	30,706	5,815b
2000	2,051c	32,278a	6,113b
2010	2,283c	35,942a	6,806b
2020	2,489c	39,170a	7,418b
2025	2,581c	40,626a	7,693b

a/Estimate by Office State Budget and Management
b/Estimated County Population x Township % of County
c/Estimated Township population x Bladenboro % of Township

The most important population estimate for development of the thoroughfare plan is that of the planning area. Even though government census data is not available for the transportation planning area, other methods of estimation of population are available. The 1996 housing "windshield" survey for this study area gave a final count of 1,554 homes inside the Bladenboro Planning Area. The housing count was then multiplied by the average persons per dwelling unit for the planning area (2.41), to give a total planning area population of 3,745. Population projections are shown in Table 7.

Table 7

Planning Area Population Forecasts

Year	Population
1996	3,745
2000	3,897
2010	4,305
2020	4,755
2025	4,998

Economy and Employment

One of the more important factors to be considered in estimating the future traffic growth of an area is its economic base. The number of employers and the employee's income or purchasing power influences how much population can be supported in the area and the number of motor vehicles that will be locally owned and operated. Generally, as the family income increases so does the number of vehicles owned, as well as the number of vehicles trips generated per day by

each household. An accurate projection of the future economy of the area is essential to estimating future travel demand.

Factors which will influence economic growth and development in Bladenboro Planning Area over the 30 year planning period is development along the NC 211 Business and NC 410 corridors and in the downtown area. The working population of Bladenboro is mainly a mixture of industrial, service, and retail industries. These three types of employment employ just under 90% of the working population of Bladenboro. Table 8, Employment Break Down, for Bladenboro was developed using the sum of the estimated jobs of each employer for 1996.

Table 8

Employment Break Down for Bladenboro

Type of Employment	Employment 1996	Employment 2025
Industrial	571	727
Retail	104	188
Highway Retail	96	126
Office	36	63
Service	319	399
Total	1126	1503

Land Use

Land use refers to the physical patterns of activities and functions within a city or county. Nearly all traffic problems in a given area can attributed in some form to the type of land use. For example, a large industrial plant might be the cause of congestion during shift change hours as its workers come and go. However, during the remainder of the day few problems, if any, may occur. The spatial distribution of different types of land use is the predominant determinant of when, where, and why congestion occurs. The attraction between different land uses and their association with travel varies depending on the size, type, intensity, and spatial separation of each.

For use in transportation planning, land uses are grouped into four categories:

1. Residential - all land devoted to the housing of people (excludes hotels and motels)

2. Commercial - all land devoted to retail trade including consumer and business service and office

3. Industrial - all land devoted to manufacturing, storage, warehousing, and transportation of products

4. Public - all land devoted to social, religious, educational, cultural, and political activities.

Figure 9 shows the planning area's existing land use.

Anticipated future land use is a logical extension of the present spatial distribution. Determination of where expected growth is to occur within the planning area facilitates the location of proposed thoroughfares or the improvements of existing thoroughfares. Areas of anticipated development and growth for Bladenboro are:

1. Residential - A large amount of Bladenboro's residential land development is located in the central to northwestern portion or the planning area. The potential for new residential development can be found mainly in the northern and southern sections of the planning area.

2. Commercial/Retail - Most of the commercial development in Bladenboro is on Business NC 211 and NC 131-242-410 and in the Central Business District. It is anticipated that the these corridors in the Central Business District will continue to develop in the future.

3. Industrial - The industrial development in Bladenboro is located just outside the Central Business District portion of the planning area along the Business NC 211 corridor. The potential for new industrial development is anticipated to be in the western planning area along Business 211 in the vicinity of SR 1179.

4. Public - The Town of Bladenboro has no public areas within the planning area. The only public facilities that are located in the planning area are at the two schools.

The northern and southern portions of the planning area have the largest growth expectations. Hopefully, the implementation of the thoroughfare plan will help alleviate any traffic congestion due to the new development.

Future Travel Demand

Travel demand is generally reported in average daily traffic counts. Traffic counts are taken regularly in and around Bladenboro by the North Carolina Department of Transportation. To estimate future travel demand, traffic trends over the past twenty years were studied. A comparison of annual growth rates from 1970 to 1996 at various count locations in Bladenboro shows the average annual growth rates ranging from 0.1 % to 13.0%. The largest growth was noted on lower volume roads, where a given increase will result in a higher percentage. Figures 4 and 5 shows existing and expected traffic volumes for the Bladenboro Planning Area. The introduction of new residential and commercial developments in the planning area will cause increases in traffic growth in those immediate areas. Eventually, this increase will level off and follow the growth pattern of the surrounding area.

ZONE MAP

LEGEND

PLANNING AREA BOUNDARY

ZONE LINES

ZONE NUMBER 000

N

S

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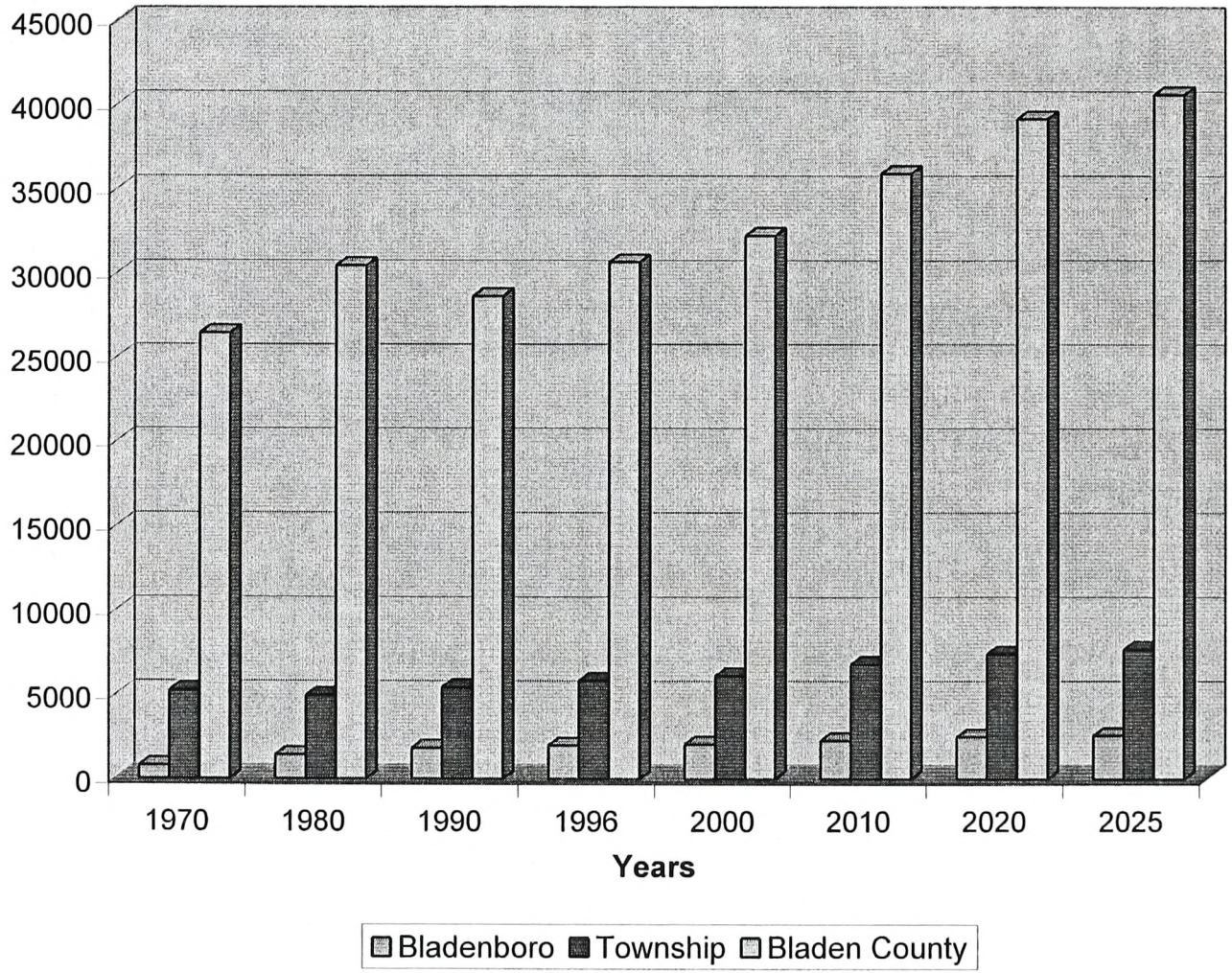
SCALE

0 1000 2000 4000 FEET

BASE MAP 12-01-95

FIGURE 7

Figure 8
Bladenboro Population Projections



Chapter 6
Environmental Concerns

In recent years, environmental considerations associated with highway construction have come to the forefront of the planning process. The legislation that dictates the necessary procedures regarding environmental impacts is the National Environmental Policy Act. Section 102 of this act requires the execution of an environmental impact statement, or EIS, for road projects that have a significant impact on the environment. Included in an EIS would be the project's impact on wetlands, water quality, historic properties, wildlife, and public lands. While this report does not cover the environmental concerns in as much detail as an EIS would, preliminary research was done on several of these factors and is included below.

Wetlands

In general terms, wetlands are lands where saturation with water is the dominant factor in determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. The single feature that most wetlands share is soil or substrata that is at least periodically saturated with or covered by water. Water creates severe physiological problems for all plants and animals except those that are adapted for life in it or in saturated soil.

Wetlands are crucial ecosystems in our environment. They help regulate and maintain the hydrology of our rivers, lakes, and streams by slowly storing and releasing floodwaters. They help maintain the quality of our water by storing nutrients, reducing sediment loads, and reducing erosion. They are also critical to fish and wildlife populations. Wetlands provide an important habitat for about one third of the plant and animal species that are federally listed as threatened or endangered.

In this study, the impacts to wetlands were determined using the National Wetlands Inventory Mapping, available from the U. S. Fish and Wildlife Service. The locations of wetlands throughout the Bladenboro Planning Area are shown in Figure 9.

Wetland impacts have been avoided or minimized to the greatest extent possible while preserving the integrity of the transportation plan.

Threatened and Endangered Species

A preliminary review of the Federally Listed Threatened and Endangered Species within the Bladenboro Planning Area was done to determine the effects that new corridors could have on the wildlife. These species are identified using mapping from the North Carolina Department of Environment, Health, and Natural Resources.

The Threatened and Endangered Species Act of 1973 allows the U. S. Fish and Wildlife Service to impose measures on the Department of Transportation to mitigate the environmental impacts of a road project on endangered plants and animals and critical wildlife habitats. By locating rare species in the planning stage of road construction, we are able to avoid or minimize these impacts.

There were no threatened or endangered species identified in the Bladenboro Planning Area, as shown in Figure 9. Nevertheless, a detailed field investigation is recommended prior to construction of any highway project in this area.

Historic Sites

The location of historic sites in the planning area was investigated to determine the possible impacts of the various projects studied. The federal government has issued guidelines requiring all State Transportation Departments to make special efforts to preserve historic sites. In addition, the State of North Carolina has issued its own guidelines for the preservation of historic sites. These two pieces of legislation are described below:

National Historic Preservation Act - Section 106 of this act requires the Department of Transportation to identify historic properties listed in the National Register of Historic Places and properties eligible to be listed. The DOT must consider the impacts of its road projects on these properties and consult with the Federal Advisory Council on Historic Preservation.

NC General Statute 121-12(a) - This statute requires the DOT to identify historic properties listed on the National Register, but not necessarily those eligible to be listed. DOT must consider impacts and consult with the North Carolina Historical Commission, but it is not bound by their recommendations.

There are currently four historic properties in the Bladenboro Planning Area that are listed on the National Register of Historic Places. These properties are shown in Figure 9 and listed below.

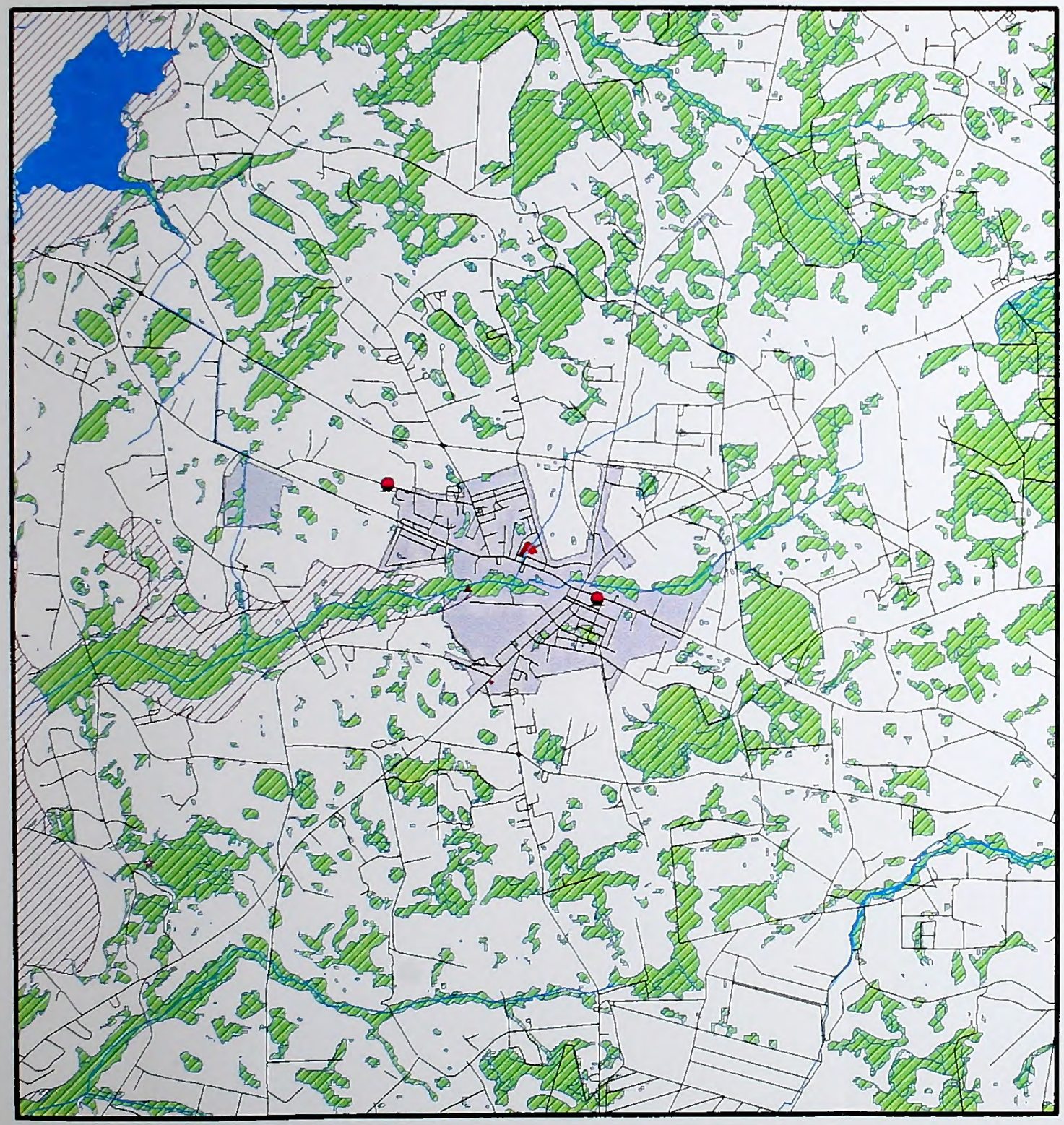
- Bladenboro Cotton Mill
- Bridger Company
- Philip Ward House
- Bladenboro Depot & Freight Office

Some of these properties may be affected by the projects proposed on the thoroughfare plan. However, care should be taken to make certain that all historic sites and natural settings are preserved. Therefore, a closer study should be done in regard to the local historic sites prior to the construction of any proposal.

Archaeology

There were numerous archaeology sites of significance located in the Bladenboro Planning Area. These sites were mainly located in the vicinity of BUS 211, and in several other sites. Therefore, a closer study should be done in regard to the archaeological sites prior to the roadway improvements or construction.

Environmental Data
Bladenboro, NC



Legend

- Ambient Water Quality Monitoring Sites
- Citizen Water Quality Monitoring Sites
- National Pollution Discharge Elimination Sites
- Surface Water Intakes
- Groundwater Incidents
- Air Quality Pollution Discharge Points
- Nat. Heritage Occurance Sites
- Historical Structures
- Historical Districts
- Solid Waste Facilities
- Hazardous Waste Facilities
- Superfund Points (Haz. Subs. Dispos. Sites)
- Superfund Areas (Haz. Subs. Dispos. Sites)
- Artificial Marine Reefs
- Sub Root Vasculars (pnt)
- Sub root Vasculars (area)
- Primary Roads
- Airports
- Railroads
- Secondary Roads
- other roads
- Hydro - Rivers/Streams
- Hydro - Water Bodies
- HQW Zones
- Groundwater Recharge/Discharge Areas
- Water Supply Watersheds
- Land and Water Consv. Fund
- Federally Owned Lands
- State Parks
- Municipal Boundries
- Wetland Areas
- DOT Roads

0 0.4 0.8 1.6 2.4 3.2 Miles

N W E S

Figure 9

Chapter 7

Traffic Model Development

In order to develop an efficient thoroughfare plan for the Town of Bladenboro it was necessary to develop and calibrate a traffic model of the town. To develop a traffic model the following things are necessary: define the study area, and project socioeconomic data to the design year. Once the socioeconomic data has been projected the model may be used to evaluate various street system problems and alternate solutions to the problems.

The Study Area

The study area of Bladenboro consists of the town and some additional outlying areas (Figure 7). This area was divided into 59 zones for data collection and aggregation. These zones reflect similar land use throughout the planning area. The data for the dwelling units and employment for 1996 was collected from census data and windshield surveys. The projection of socioeconomic data to the future year was done based on past trends from previous census data and projections by the Office of State Planning.

The Base Year Network

The purpose of the traffic model is to replicate the conditions on the Town street system. Therefore it is necessary to represent the existing street system in the model. There is a balance between having too many streets on the model to allow it to be calibrated and not having enough streets to realistically duplicate existing conditions. Generally, all the major arterials and some of the major land access or collector streets need to be represented.

Street capacity is an important component of the model. The volume to capacity ratio (v\c) gives us our best indication of present and future traffic congestion.

Speed and distance are the major factors that define the minimum time paths form zone to zone. The model uses the minimum time paths as the basis for assigning traffic to streets. Generally in the Bladenboro model the speeds assigned to links of the street system are at or slightly below the posted speed limit. Figure 11 shows the Tranplan Network overlaid on the actual street system.

Data Requirements

In order to produce an adequate traffic model of the study area, two additional types of data are required. First, traffic counts on routes used in the model provide a basis for calibrating the model. These traffic counts show a snapshot of traffic conditions in the study area. Second, socioeconomic data (housing counts and employment estimates) are necessary in order to generate traffic for the model. The housing and socioeconomic data for the model are shown in Figures 13 and 14.

TRANPLAN NETWORK

LEGEND

NETWORK LINKS

N

S

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SCALE

0 1000 2000 4000 FEET

Figure 10

BASE MAP 1-10-90

Traffic Counts

The model must be calibrated against existing conditions in the study area. In order to calibrate the model, traffic counts must be taken at various locations around the study area. The counts for much of the Bladenboro study were collected during November of 1996. Traffic count locations are found in Figure 12.

Also, volumes on all routes crossing the planning area boundary were counted. These counts show how much traffic is entering and exiting the study area.

Socioeconomic Data

The required data consists of housing counts and employment estimates. The housing counts are used in the model as the generator of trips and employment is used as the attractor of trips.

The best indicator of the average number of trips is made from a household income. Since there is no adequate method for determining household income, the type and quality of housing was used as an indicator of household income. The Statewide Planning staff conducted a windshield survey in November of 1996 to collect housing and employment data. The housing inventory was divided into five categories: excellent, above average, average, below average, and poor. Each of these categories was assigned a slightly different trip generation rate. Figure 13 shows the housing counts for each traffic zone.

The employment data that was collected was broken out by Standard Industrial Code classification and grouped into five categories: industry, special retail, retail, office and services. Representatives of the Statewide Planning Unit gathered the number of employees of each business. This data was used with a regression equation developed from an origin and destination survey of a similar size town to produce an attraction factor for each zone. Figure 14 shows total employment by traffic analysis zone.

Commercial Vehicles

Commercial vehicles have somewhat different trip generation characteristics than do privately owned vehicles. An inventory of commercial vehicles was done at the same time as the employment and housing inventory for the study area.

Trip Generation

The trip generation process is the process by which external station volumes, housing data, and employment data are used to generate traffic volumes that duplicate the traffic volumes on the street network. The technical definition of a trip is slightly different then the definition of a trip used by the general public. Technically, a trip only has one origin and one destination while the layman will often group, or chain, several short trips together as one longer trip.

Traffic inside the study area has three major components: through trips, internal-external trips, and internal trips. Through trips are produced outside the planning area and pass through enroute to a destination outside the planning area. Internal-external trips have one end of the trip outside of the planning area. Internal trips have both their origin and destination inside the planning area. For clarity, the internal trips are further subdivided into trip purposes. The trip purposes for Bladenboro are home-based work, other-home based, and non-home based.

Through Trips

The Through Trip Table for this study was developed based on Technical Report 3 (Synthesized Through Trip Table for Small Urban Areas By Dr. David G. Modlin, Jr.).

Once these volumes were developed, the Fratar balancing method was then used to balance the trip interchanges so that the total number of through trips at each external station is consistent with the total number of through trips at every other station. Generally five iterations are sufficient to balance the estimate between external zones.

External - Internal

The external-internal trip volume was determined by subtracting the through trip volume at each station from the total traffic volume at that station. See Table 11 for external-internal and through trip values.

Internal Data Summary (IDS)

IDS is the process that takes the external-internal traffic volumes, housing data, employment data, generation rates, and regression equations and generates the trip productions and trip attractions required by the gravity model. Housing units were stratified to account for differing trip generation rates for each classification. The individual trip generation rates give an average trip generation rate for the study area of 6.86 trips per dwelling unit (du) for 1996. Trip attractions were produced using regression equations. The regression equations consider trip attractions to be related to the employment characteristics of the traffic zones. The regression equations for Bladenboro are:

$$\text{HBW } Y = 1.0X_1 + 1.0X_2 + 1.0X_3 + 1.0X_4 + 1.0X_5 + 1.0X_6$$
$$\text{OHB } Y = 0.5X_1 + 3.0X_2 + 6.0X_3 + 2.5X_4 + 1.0X_5 + .01X_6$$
$$\text{NHB } Y = 0.5X_1 + 3.0X_2 + 6.0X_3 + 2.5X_4 + 1.0X_5 + .01X_6$$
$$\text{EXT } Y = 0.5X_1 + 3.0X_2 + 6.0X_3 + 2.5X_4 + 1.0X_5 + .01X_6$$

Where:

- Y = Attraction factor for each zone
- X_1 = Industry (SIC codes 1-49)
- X_2 = Retail (SIC codes 55,58)
- X_3 = Special Retail (SIC codes 50-54, 56, 57, 59)
- X_4 = Office (SIC codes 60-67, 91-97)
- X_5 = Services (SIC codes 70-76, 78-89, 99)
- X_6 = Special Industrial (Plant)

The output of the IDS program are trip productions and trip attractions for each zone divided into four trip purposes: home-based work, other home-based, non-home based and external-internal. The trips are segregated into trip purposes because different trip lengths are associated with each trip purpose.

Internal Trip Distribution

Once the number of trips per traffic zones are determined, the trips must still be distributed to other traffic zones. The preferred method of distributing internal and external-internal trips, called the

'Gravity Model', states that the number of trips between Zone A and Zone B is multiplied by a travel time factor. The gravity model takes the form:

$$T_{ij} = \frac{P_i \times A_j \times F_{ij}}{\text{Sum } x=1,n \text{ of } A_x \ F_{t,x}}$$

T_{ij} = The number of trips produced in zone I and attracted to zone j.
P_i = The number of trips produced in zone i.
A_j = The number of trips attracted to zone j.
F_{ij} = The travel time factor.
n = The total number of zones.
i = The origin zone number.
j = The destination zone number.
x = Any zone number.

The travel time factor or friction factor (F) is critical to the gravity model distribution and must be derived empirically. The friction factor is dependent on the distance between the traffic zones and the time necessary to travel these distances. This factor is also dependent on the trip purpose. In order to derive this factor a gravity model calibration program is run with an initial friction factor and trip length frequency curve for each trip purpose. The initial friction factors used in the Bladenboro model were 100 for all trip purposes and time increments. Table 12 shows the actual values used for the friction factors and trip length frequency curves.

Model Calibration

The purpose of a traffic model is to predict the traffic on a street system at some future point in time; however, if the model is not accurate, it is useless for this purpose. Therefore the model must duplicate the existing traffic pattern. The actual calibration of the model is an iterative process in which incremental changes are made either in the trip generation, tip distribution, or the street network. The purpose of each change is to allow the model to more accurately reflect the real world conditions upon which it is based. Only when the model can adequately reflect the existing traffic pattern should it be used to predict traffic in the future. The model was calibrated with 1996 Average Daily Traffic Counts on all routes that it was available.

Accuracy Checks

There are three checks made on the model. The first is to follow trips through all the steps involved in the model. The purpose of this check is to insure that no trips have been accidentally added to or subtracted from the model, and that no trips have been counted twice.

The second check is to compare the model generated trips on the screenlines with the ground counts taken at the screenlines. A model is considered to accurately reflect the overall patterns if the trips it generates are from 95% to 105% of the ground counts on the screenlines. Table 9 compares the ground counts with the model traffic volumes on the screenlines. See Figure 11 for screenline locations.

The final check for the model is to match the traffic volumes on the links in the model with the ADT at the same locations. The 'link counts' can be used to find particular places in the network where there are problems. Comparing the link counts with the ground counts for those links did not reveal any significant problems with the model.

Table 9

Actual vs Model Screenline Total

Screenline	Ground Count	Model Volume	Percent
A NS	19,670	20,105	1.02
B EW	15,680	15,295	0.98

Data Projections to the Design Year

In order to make use of the model, the base year data must be modified to reflect assumed conditions in the design year. These projections and the previously developed regression equations were used to produce trip productions and attractions in the same manner as the base year.

Dwelling Unit Projections

Future dwelling units were determined by extending person per dwelling unit trends for Bladen County linearly to the design year. The number of dwelling units is projected to increase by 44%. The Statewide Planning Unit projected residential growth and with the help of the Town Administrator distributed these houses throughout the planning area. Figure 13 compares the classification of dwelling units in 1996 with the assumed classification in 2025.

Employment Projections

The Statewide Planning Unit and the Town Administrator projected and distributed the 2025 employment to the zones they anticipated employment growth. Those projections were added to the 1996 data. Employment projections throughout the planning area indicated steady growth. Figure 14 compares the classification of employment data in 1996 with the assumed classification in 2025.

External and Through Trips

For the design year, external and through trip were projected from the base year using a linear projection of the past growth rate at each external station. Cordon Station Data can be found in Table 13.

TRAFFIC COUNT LOCATION

LEGEND

- LOCATION

N

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SCALE

0 1000 2000 4000 FEET

FIGURE 11

BASE MAP : 12-10-96

HOUSING BY ZONE

LEGEND

PLANNING AREA BOUNDARY

ZONE LINES

1996 HOUSING
2025 HOUSING

ZONE NUMBER	1996 HOUSING	2025 HOUSING
2	46	52
13	7	7
14	30	30
23	2	2
26	0	0
30	10	10
31	107	107
36	0	0
37	33	33
38	24	24
39	106	120
40	55	79
41	20	20
45	16	16
53	5	14
54	5	20

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SCALE

0 1000 2000 4000 FEET

FIGURE 12

BASE MAP 12-10-96

EMPLOYMENT BY ZONE

LEGEND

PLANNING AREA BOUNDARY

ZONE LINES

1996 EMPLOYMENT
2025 EMPLOYMENT

ZONE NUMBER	2000 EMPLOYMENT	2025 EMPLOYMENT
2	48	43
13	31	65
14	62	60
23	60	81
26	65	74
30	29	32
31	18	18
36	48	55
37	16	19
38	1	6
39	252	238
40	0	0
41	2	2
45	1	1
53	6	8
54	0	9

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SCALE

0 1000 2000 4000 FEET

FIGURE 13

Table 10

Travel Model Input Variables

Trip Percentages by Purpose	Year	Persons/DU	Persons/Veh
Internal of Total 90%			
HBW 25%	1996	2.41	1.27
OHB 50%			
NHB 25%	2025	2.23	1.15

Composite Factor

$$\text{Composite Factor} = \frac{\text{1996 Persons/Veh}}{\text{2025 Persons/Veh}} \times \text{Usage Factor} \times \frac{\text{2025 Persons/DU}}{\text{1996 Persons/DU}}$$

$$= \frac{1.27}{1.15} \times 0.99 \times \frac{2.23}{2.41} = 1.01$$

Increase For Design Year Generation Rates

Generation Rates = Average 1996 Trip Rate X Composite Factor - Average 1996 Trip Rate

Increase for 2025 Generation Rates = 0.10 (6.86 X 1.01) - 6.86 = 0.08

Secondary NHB Trip Development

Secondary NHB Trips = Total Ext-Int Trips - Ext-Int Trips Garaged Inside Planning Area X 0.30*

1996 Secondary Trips = (14,634 - 1,600) X 0.30 = 3,910

2025 Secondary Trips = (23,654 - 2,329) X 0.30 = 6,398

The breakdown of internal trips by purpose and total of non-home based trips generated externally are shown in Table 11.

*Assumed NHB trip making rate per each one-way external-internal trip by vehicles garaged outside the planning area.

Table 11

Travel Data Summary

Type		1996	2025
Average Daily Trips per DU		6.86	6.93
Internal Trips		9,066	13,196
Home Based Work		2,267	3,299
Other Home Based		4,533	6,598
Non-Home Based, Internal		2,267	3,299
NHB Secondary		3,910	6,398
Internal <-> External		14,634	23,654
Through Trips		3,598	5,458
	Total Daily Trips	31,208	48,706

Table 12

Friction Factors & Travel Curve Data
Bladenboro

	Friction Factors				Travel Curves			
					% Trips Distributed			
Time Interval	HBW	OHB	NHB	Ext - Int	HBW	OHB	NHB	Ext-Int
1	5711	8928	12564	6863	8.85	12.62	34.86	2.19
2	8538	10217	10372	8684	21.70	26.90	30.08	7.48
3	9441	9943	8169	9187	33.98	29.03	22.25	18.21
4	8364	8552	6264	8483	20.16	18.03	8.21	27.58
5	6432	6758	4772	7138	10.70	9.08	3.25	25.77
6	4652	5100	3687	5716	3.70	3.45	1.10	12.19
7	3428	3819	2948	4547	0.75	0.64	0.21	4.67
8	2788	2950	2488	3752	0.18	0.18	0.03	1.51
9	2711	2443	2264	3353	0.00	0.07	0.00	0.41

Table 13

Cordon Station Travel

Computer Station	Base Year - 1996			Future Year - 2025		
	Total ADT	Thru Trip End	Ext - Int Trips	Total ADT	Thru Trip End	Ext - Int Trips
1	2,300	694	1,606	3,650	1,096	2,554
2	130	6	124	235	10	225
3	3,200	1,276	1,924	4,580	1,832	2,748
4	350	18	332	1,060	52	1,008
5	1,830	734	1,096	3,230	1,292	1,938
6	70	0	70	100	4	96
7	2,750	826	1,924	3,720	1,118	2,602
8	400	22	378	470	26	444
9	370	22	348	1,150	58	1,092
10	3,000	602	2,398	4,290	858	3,432
11	3,000	1,796	1,204	4,040	2,422	1,618
12	490	28	462	970	50	920
13	3,900	1,172	2,728	7,000	2,098	4,902
14	40	0	40	75	0	75

APPENDICES

Appendix A
Thoroughfare Planning Principles

There are many advantages to thoroughfare planning, but the primary mission is to assure that the road system will be progressively developed to serve future travel desires. Thus, the main consideration in thoroughfare planning is to make provisions for street and highway improvements so that, when the need arises, feasible opportunities to make improvements exist.

Benefits of Thoroughfare Planning

There are two major benefits derived from thoroughfare planning. First, each road or highway can be designed to perform a specific function and provide a specific level of service. This permits savings in right-of-way, construction, and maintenance costs. It also protects residential neighborhoods and encourages stability in travel and land use patterns. Second, local officials are informed of future improvements and can incorporate them into planning and policy decisions. This will permit developers to design subdivisions in a non-conflicting manner, direct school and park officials to better locate their facilities, and minimize the damage to property values and community appearance that is sometimes associated with roadway improvements.

Objectives of Thoroughfare Planning

Typically, the urban street system occupies 25 to 30 percent of the total developed land in an urban area. Since the system is permanent and expensive to build and maintain, much care and foresight are needed in its development. Thoroughfare planning is the process public officials use to assure the development of the most appropriate street system that will meet existing and future travel desires within the urban area.

The primary aim of a thoroughfare plan is to guide the development of the urban street system in a manner consistent with the changing traffic patterns. A thoroughfare plan will enable street improvements to be made as traffic demands increase, and it helps eliminate unnecessary improvements, so needless expense can be averted. By developing the urban street system to keep pace with increasing traffic demands, a maximum utilization of the system can be attained, requiring a minimum amount of land for street purposes. In addition to providing for traffic needs the thoroughfare plan should embody those details of good urban planning necessary to present a pleasing and efficient urban community. The location of present and future population along with commercial and industrial development affects major street and highway locations. Conversely, the location of major streets and highways within the urban area will influence the urban development pattern.

Other objectives of a thoroughfare plan include:

- Providing for the orderly development of an adequate major street system as land development occurs;
- Reducing travel and transportation costs;
- Reducing the cost of major street improvements to the public through the coordination of the street system with private action;

- Enabling private interest to plan their actions, improvements, and development with full knowledge of public intent;
- Minimizing disruption and displacement of people and businesses through long range advance planning for major street improvements;
- Reducing environmental impacts, such as air pollution, resulting from transportation, and
- Increasing travel safety.

Thoroughfare planning objectives are achieved through improving both the operational efficiency of thoroughfares, and the system efficiency through system coordination and layout.

Operational Efficiency

A roadway's operational efficiency is improved by increasing the capability of the roadway to carry more vehicular traffic and people. In terms of vehicular traffic, a roadway's capacity is defined by the maximum number of vehicles that can pass a given point on a roadway during a given time period under prevailing roadway and traffic conditions. Capacity is affected by the physical features of the roadway, nature of traffic, and weather.

Physical ways to improve vehicular capacity include:

- **Roadway widening** - Widening of a road from two to four lanes more than doubles the capacity of the road by providing additional maneuverability for traffic.
- **Intersection improvements** - Increasing the turning radii, adding exclusive turn lanes, and channelizing movements can improve the capacity of an existing intersection.
- **Improving vertical and horizontal alignment** - Alignment improvements reduce the congestion caused by slow moving vehicles.
- **Eliminating roadside obstacles** - Improving lateral clearance reduces side friction and improves a driver's field of sight.

Operational ways to improve roadway capacity include:

- **Control of Access** - A roadway with complete access control can often carry three times the traffic handled by a non-controlled access road with identical width and number of lanes.
- **Parking removal** - Increases capacity by providing additional roadway width for traffic flow and reducing friction to flow caused by parking and unparking vehicles.
- **One-way operation** - The capacity of a road can sometimes be increased 20 -50%, depending upon turning movements and overall roadway width, by initiating one-way traffic operations. One-way streets can also improve traffic flow by decreasing potential traffic conflicts and simplifying traffic signal coordination.
- **Reversible lane** - Reversible traffic lanes may be used to increase roadway capacity in situations where heavy directional flows occur during peak periods.
- **Signal phasing and coordination** - Uncoordinated signals and poor signal phasing restrict traffic flow by creating excessive stop-and-go operation.

Altering travel demand is a third way to improve the efficiency of existing roads. Travel demand can be reduced or altered in the following ways:

- **Carpools** - Encouraging the formation of carpools and vanpools for journeys to work and other trip purposes reduces the number of vehicles on the roadway and raises the people carrying capability of the street system.
- **Alternate mode** - Encouraging the use of transit and bicycle reduces vehicular congestion.
- **Work hours** - Programs by industries, businesses, and institutions to stagger work hours or establish variable work hours for employees spreads peak travel over a longer time period and thus reduces peak hour demand.
- **Land use** - Planning land use can control development or redevelopment in a more travel efficient manner.

System Efficiency

Another means for altering travel demand is the development of a more efficient system of roads that will better serve travel desires. A more efficient transportation system can reduce travel distances, time, and user costs. Improvements in system efficiency can be achieved through the concept of functional classification of streets and development of a coordinated major street system.

Thoroughfare Classification Systems

Streets perform two primary functions, traffic service and land service, which when combined, are basically incompatible. The conflict is not serious if both traffic and land service demands are low. However, when traffic volumes are high, conflicts created by uncontrolled and intensely developed abutting property lead to intolerable traffic flow friction and congestion.

The underlying concept of the thoroughfare plan is that it provides a functional system of streets that permits travel from origins to destinations with directness, ease and safety. Different streets in this system are designed and called on to perform specific functions, thus minimizing the traffic and land service conflict.

Urban Classification

In the urban thoroughfare plan, elements are classified according to the function they serve. Roadways may be classified as major thoroughfares, minor thoroughfares, or local access streets.

Local Access Streets provide access to abutting property. They are not intended to carry heavy volumes of traffic and should be located such that only traffic with origins and destinations of the streets could be served. Local streets may be further classified as residential, commercial, and/or industrial depending upon the type of land use that they serve.

Minor Thoroughfares are more important streets on the city system. They collect traffic from the local access streets and carry it to the major thoroughfares. They may in some instances supplement the major thoroughfare system by facilitating minor through traffic movements. A third function that may be performed is that of providing access to abutting property. They should be designed to serve limited areas so that their development as major thoroughfares will be prevented.

Major Thoroughfares are the primary traffic arteries of the city. Their function is to move intra-city and inter-city traffic. The streets that comprise the major thoroughfare system may also serve abutting property; however, their principle function is to carry traffic. They should not be bordered by uncontrolled strip development because such development significantly lowers the capacity of the thoroughfare to carry traffic and each driveway is a danger and impediment to traffic flow. Major thoroughfares may range from a two-lane street carrying minor traffic volumes to major expressways with four or more traffic lanes. Parking normally should not be permitted on major thoroughfares.

Idealized Major Thoroughfare System

A coordinated system of major thoroughfares forms the basic framework of the urban street system. A major thoroughfare system that is most adaptable to desire lines of travel within an urban area is the radial-loop system. It permits movement between various areas of the city within maximum directness. This system consists of several functional elements: radial streets, cross-town streets, loop system streets, and bypasses (Figure A-1).

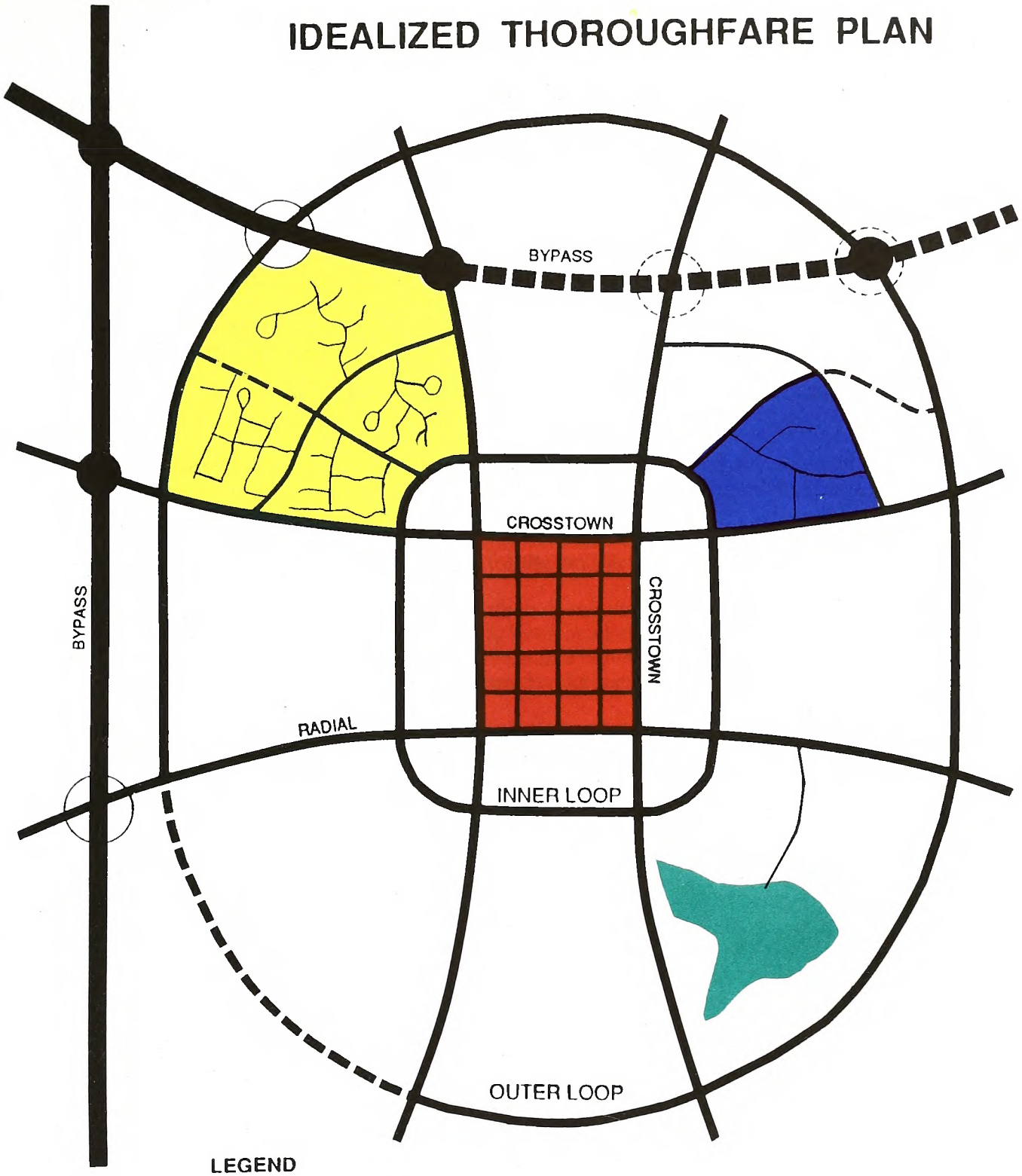
Radial streets provide for traffic movement between points located on the outskirts of the city and the central area. This is a major traffic movement in most cities, and the economic strength of the central business district depends upon the adequacy of this type of thoroughfare.

If all radial streets crossed in the central area, an intolerable congestion problem would result. To avoid this problem, it is very important to have a system of cross-town streets that form a loop around the central business district. This system allows traffic moving from origins on one side of the central area to destinations on the other side to follow the area's border. It also allows central area traffic to circle and then enter the area near a given destination. The effect of a good cross-town system is to free the central area of cross-town traffic, thus permitting the central area to function more adequately in its role as a business or pedestrian shopping area.

Loop system streets move traffic between suburban areas of the city. Although a loop may completely encircle the city, a typical trip may be from an origin near a radial thoroughfare to a destination near another radial thoroughfare. Loop streets do not necessarily carry heavy volumes of traffic, but they function to help relieve central areas. There may be one or more loops, depending on the size of the urban area. They are generally spaced one-half mile to one mile apart, depending on the intensity of land use.

A **bypass** is designed to carry traffic through or around the urban area, thus providing relief to the city street system by removing traffic that has no desire to be in the city. Bypasses are usually designed to standards for highways supporting large volumes of high-speed traffic, including control of access. Occasionally, a bypass with low traffic volume can be designed to function as a portion of an urban loop. The general effect of bypasses is to expedite the movement of through traffic and to improve traffic conditions within the city. By freeing the local streets for use by shopping and home-to-work traffic, bypasses tend to increase the economic vitality of the local area.

IDEALIZED THOROUGHFARE PLAN



LEGEND

	EXISTING	PROPOSED
MAJOR THOROUGHFARE FREEWAY		
MAJOR OTHER		
MINOR THOROUGHFARE		
LOCAL ROAD		
INTERCHANGE		
GRADE SEPERATION		

LAND USES

- COMMERCIAL/BUSINESS
- RESIDENTIAL
- INDUSTRIAL
- PUBLIC/INSTITUTIONAL

FIGURE A-1

Application of Thoroughfare Planning Principles

The concepts presented in the discussion of operational efficiency, system efficiency, functional classification, and idealized major thoroughfare system are the conceptual tools available to the transportation planner in developing a thoroughfare plan. In actual practice thoroughfare planning is done for established urban areas and is constrained by existing land use and street patterns, existing public attitudes and goals, and current expectations of future land use. Compromises must be made because of these and the many other factors that affect major street locations.

Throughout the thoroughfare planning process it is necessary from a practical viewpoint that certain basic principles be followed as closely as possible. These principles are as follows:

- The plan should be derived from a thorough knowledge of today's travel - its component parts, and the factors that contribute to it, limit it, and modify it.
- Traffic demands must be sufficient to warrant the designation and development of each major street. The thoroughfare plan should be designed to accommodate a large portion of major traffic movements on relatively few streets.
- The plan should conform to and provide for the land development plan for the area.
- Certain considerations must be given to urban development beyond the current planning period. Particularly in outlying or sparsely developed areas that have development potential, it is necessary to designate thoroughfares on a long-range planning basis to protect right-of-way for future thoroughfare development.
- While being consistent with the above principles and realistic in terms of travel trends, the plan must be economically feasible.

Appendix B

Thoroughfare Plan Street Tabulation and Recommendations

This appendix includes a detailed tabulation of all streets identified as elements of the Town of Bladenboro Thoroughfare Plan. The table includes a description of each section, as well as the length, cross section, and right-of-way for each section. Also included are existing and projected average daily traffic volumes, roadway capacity, and the recommended ultimate lane configuration. Due to space constraints, these recommended cross sections are given in the form of an alphabetic code. A detailed description of each of these codes and a illustrative figure for each can be found in Appendix C.

The following index of terms may be helpful in interpreting the table:

NPB - Northern Planning Boundary

EPB - Eastern Planning Boundary

WPB - Western Planning Boundary

SPB - Southern Planning Boundary

ADQ - Adequate

N/A - Not Available

Appendix B

Thoroughfare Plan Street Tabulation and Recommendation

FACILITY & SECTION	EXISTING CROSS SECTION S. I. UNITS DIST km	RDWY m	ROW m	ENGLISH UNITS DIST MI	RDWY FT	ROW FT	NUMBER OF LANES	PRACTICAL CAPACITY CURRENT (FUTURE)	1996 ADT	2025 ADT	RECOMMENDED X - SECTION RDWY (ULT)	ROW (ULT)
NC 131												
SPB - SR 1171	0.51	6.10	18.3	0.32	20	60	2	6,600	1,800	3,200	ADQ	
SR 1171 - NC 410	1.17	6.10	18.3	0.73	20	60	2	12,200	3,500	5,500	ADQ	
NC 410 - NC 211B	1.00	6.10	18.3	0.62	20	60	2	12,200	8,200	10,700	ADQ	
NC 211B - NC 242	0.18	6.10	18.3	0.11	20	60	2	16,000	8,500	14,900	ADQ	
NC 242 - SR 1119	0.48	9.14	18.3	0.30	30	60	2	12,200	7,100	10,400	ADQ	
SR 1119 - NC 211	0.80	6.10	18.3	0.50	20	60	2	12,200	5,100	8,400	ADQ	
NC 211 - SR 1119	0.48	6.10	18.3	0.30	20	60	2	12,200	4,600	9,300	C	90
SR 1119 - SR 1121	1.40	6.10	18.3	0.87	20	60	2	6,600	4,100	6,800	C	90
SR 1121 - NPB	0.08	6.10	18.3	0.05	20	60	2	6,600	3,000	7,000	C	90
NC 242												
SPB - SR 1177	0.19	6.10	18.3	0.12	20	60	2	6,600	2,750	3,900	ADQ	
SR 1177 - SR 1171	0.64.	6.10	18.3	0.40	20	60	2	6,600	2,900	4,100	ADQ	
SR 1171 - SR 1176	0.98	6.10	18.3	0.61	20	60	2	12,200	2,600	3,500	ADQ	
SR 1176 - NC 131	0.39	6.10	18.3	0.24	20	60	2	12,200	3,700	5,800	ADQ	
See NC 131												
NC 131 - SR 1133	1.09	6.10	18.3	0.68	20	n/a	2	12,200	2,100	5,500	ADQ	
SR 1133 - NC 211	0.51	6.10	18.3	0.32	20	60	2	9,000	1,900	3,600	ADQ	
NC 211 - SR 1117	1.13	6.10	18.3	0.70	20	60	2	6,600	2,500	4,200	ADQ	
SR 1117 - NPB	0.51	6.10	18.3	0.32	20	60	2	6,600	2,300	3,700	ADQ	
NC 211 Business												
NC 211 - SR 1133	0.63	6.71	18.3	0.39	22	60	2	7,100	1,300	2,300	ADQ	
SR 1133 - SR 1175	1.42	6.71	18.3	0.88	22	60	2	7,100	2,100	2,900	ADQ	
SR 1175 - NC 131	0.26	6.71	18.3	0.16	22	60	2	7,100	4,200	6,300	ADQ	
NC 131 - SR 1120	0.43	6.71	18.3	0.27	22	60	2.	12,200	7,900	10,800	ADQ	
SR 1120 - SR 1100	0.61	6.71	18.3	0.38	22	60	2	7,100	8,200	9,800	ADQ	
SR 1100 - SR 1132	2.69	6.71	18.3	1.67	22	60	2	7,100	6,000	7,500	ADQ	
SR 1132 - SR 1179	0.45	6.71	18.3	0.28	22	60	2	7,100	5,000	6,000	ADQ	
SR 1179 - WPB	0.16	6.71	18.3	0.10	22	60	2	7,100	3,000	4,300	ADQ	
NC 211												
EPB - SR 1134	0.37	7.32	18.3	0.23	24	60	2	7,000	3,200	4,600	ADQ	
SR 1134 - NC 211B	0.48	7.32	18.3	0.30	24	60	2	7,000	3,300	4,800	ADQ	
NC 211B - NC 242	1.96	7.32	18.3	1.22	24	60	2	7,000	2,300	3,000	ADQ	
NC 242 - NC 131	1.24	7.32	18.3	0.77	24	60	2	7,000	3,100	5,100	ADQ	
NC 131 - SR 1119	0.45	7.32	18.3	0.28	24	60	2	7,000	3,200	5,600	ADQ	
SR 1119 - SR 1120	0.63	7.32	18.3	0.39	24	60	2	7,000	3,300	5,800	ADQ	
SR 1120 - SR 1100	0.84	7.32	18.3	0.52	24	60	2	7,000	3,200	5,500	ADQ	
SR 1100 - WPB	1.95	7.32	18.3	1.21	24	60	2	7,000	2,300	3,300	ADQ	

Appendix B

Thoroughfare Plan Street Tabulation and Recommendation

FACILITY & SECTION	EXISTING CROSS SECTION S. I. UNITS DIST km	RDWY m	ROW m	ENGLISH UNITS DIST MI	RDWY FT	ROW FT	NUMBER OF LANES	PRACTICAL CAPACITY CURRENT (FUTURE)	1996 ADT	2025 ADT	RECOMMENDED X - SECTION RDWY (ULT)	ROW (ULT)
NC 410												
See NC 131 and NC 242												
SR 1100 (Centers Road/Village Street)												
NPB - SR 1121	0.29	5.49	n/a	0.18	18	n/a	2	6,000	600	1,100	ADQ	
SR 1121 - NC 211	1.45	5.49	n/a	0.90	18	n/a	2	6,000	1,000	1,600	ADQ	
NC 211 - SR 1132	0.74	5.49	n/a	0.46	18	n/a	2	10,200	1,800	3,100	ADQ	
SR 1132 - NC 211B	0.63	5.49	n/a	0.39	18	n/a	2	10,200	2,600	3,500	ADQ	
SR 1117 (Storm Road)												
NC 131 - SR 1118	1.13	6.10	18.3	0.70	20	60	2	6,600	200	500	ADQ	
SR 1118 - NC 242	1.29	6.10	18.3	0.80	20	60	2	6,600	400	700	ADQ	
SR 1118 (Marshall Cain Road)												
NPB - SR 1121	0.40	6.10	18.3	0.25	20	60	2	6,600	100	100	ADQ	
SR 1119 (Sunset Park Road)												
NC 131 - NC 211	0.84	6.10	18.3	0.52	20	60	2	6,600	200	300	ADQ	
NC 211 - NC 131	0.77	6.10	18.3	0.48	20	60	2	6,600	100	500	ADQ	
SR 1120 (Butler's Mill Road)												
SR 1121 - NC 211	2.25	5.49	n/a	1.40	18	n/a	2	6,000	600	1,000	ADQ	
NC 211 - NC 211B	1.40	5.49	n/a	0.87	18	n/a	2	10,200	900	1,100	ADQ	
SR 1121 (Zion Hill Church Road)												
SR 1100 - SR 1120	1.45	6.10	n/a	0.90	20	n/a	2	6,600	200	400	ADQ	
SR 1120 - NC 131	1.77	6.10	n/a	1.10	20	n/a	2	6,600	300	600	ADQ	
SR 1132 (Chestnut Street)												
SR 1100 - NC 211B	2.33	5.49	n/a	1.45	18	n/a	2	10,200	1,000	1,300	ADQ	
SR 1133												
NC 211B - NC 242	1.91	6.10	18.3	1.19	20	60	2	6,600	250	600	ADQ	
SR 1134 (Burney Street)												
EPB - NC 211	0.72	6.10	18.3	0.45	20	60	2	6600	150	200	ADQ	
SR 1171 (Old Abbottsburg Road)												
NC 242 - NC 131	1.01	6.10	18.3	0.63	20	60	2	6,600	400	700	ADQ	
NC 131 - SR 1174	1.30	6.10	18.3	0.81	20	60	2	6,600	500	1,000	ADQ	
SR 1174 - EPB	1.93	5.49	18.3	1.2	18	60	2	6,600	300	1,000	ADQ	

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Thoroughfare Plan Street Tabulation and Recommendation

FACILITY & SECTION	EXISTING CROSS SECTION S. I. UNITS DIST km	RDWY m	ROW m	ENGLISH UNITS DIST MI	RDWY FT	ROW FT	NUMBER OF LANES	PRACTICAL CAPACITY CURRENT (FUTURE)	1996 ADT	2025 ADT	RECOMMENDED X - SECTION RDWY (ULT)	ROW (ULT)
SR 1174 (Bladen Street)												
SR 1171 - SR 1175	1.87	6.10	18.3	1.16	20	60	2	12,200	500	1,200	ADQ	
SR 1175 (4th Street)												
Bladen St. - NC 211B	1.64	6.10	n/.a	1.02	20	n/a	2	12,200	900	1,600	ADQ	
SR 1176 (Forest Drive)												
SPB - SR 1177	0.10	6.10	18.3	0.06	20	60	2	6,600	400	500	ADQ	
SR 1177 - SR 1178	1.22	6.10	18.3	0.76	20	60	2	6,600	500	1,500	ADQ	
SR 1178 - NC 242	2.11	6.10	18.3	1.31	20	60	2	7,000	600	1,300	ADQ	
SR 1177 (Galeed Church Road)												
SR 1176 - NC 242	1.32	6.10	18.3	0.82	20	60	2	6,600	100	300	ADQ	
NC 242 - SPB	0.18	6.10	18.3	0.11	20	60	2	7,100	100	100	ADQ	
SR 1178 (Richardson Road)												
WPB - SR 1179	0.27	5.49	n/a	0.17	18	n/a	2	6,000	400	1,300	ADQ	
SR 1179 - SR 1176	1.77	5.49	n/a	1.1	18	n/a	2	6,000	600	1,200	ADQ	
SR 1179 (Bryant Swamp Road)												
SR 1178 - NC 211B	1.22	6.10	18.3	0.76	20	60	2	6,600	800	2,000	ADQ	
Proposed NC 131-242-410 Bypass												
NC 242 - SR 1176	-----	-----	-----	-----	-----	-----	2	12,500	-----	2,800	A	200
SR 1176 - NC 211B	-----	-----	-----	-----	-----	-----	2	12,500	-----	2,800	A	200
NC 211B - NC 211	-----	-----	-----	-----	-----	-----	2	12,500	-----	2,800	A	200
Proposed New Connector												
Bladen St - Pine Ridge	-----	-----	-----	-----	-----	-----	2	12,500	-----	1,000	K	100
Railroad Street Extension												
Ash St. - NC 211B	-----	-----	-----	-----	-----	-----	2	12,500	-----	4,000	K	100
East Railroad Street Extension												
Ash St. - NC 211B	-----	-----	-----	-----	-----	-----	2	12,500	-----	2,200	K	100

Appendix C
Typical Cross Sections

Cross section requirements for thoroughfares vary according to the desired capacity and level of service to be provided. Universal standards in the design of thoroughfares are not practical. Each street section must be individually analyzed and its cross section requirements determined on the basis of amount and type of projected traffic, existing capacities, desired level of service, and available right-of-way.

Typical cross section recommendations are shown in Figure C-1. These cross sections are typical for facilities on new location and where right-of-way constraints are not critical. For widening projects and urban projects with limited right-of-way, special cross sections should be developed that meet the needs of the project.

Recommended typical cross sections for thoroughfares were derived on the basis of projected traffic, existing capacities, desirable levels of service, and available right-of-way. The recommended typical cross sections for the thoroughfares are given in Appendix B, Table B-1 along with other pertinent information.

On all existing and proposed major thoroughfares delineated on the thoroughfare plan, adequate right-of-way should be protected or acquired for the ultimate cross sections. Ultimate desirable cross sections for each of the thoroughfares are listed as part of the Street Inventory in Appendix B. Recommendations for "ultimate" cross sections are provided for the following:

- thoroughfares which may require widening after the current planning period,
- thoroughfares which are borderline adequate and accelerated traffic growth could render them deficient, and
- thoroughfares where an urban curb and gutter cross section may be locally desirable because of urban development or redevelopment.

Recommended design standards relating to maximum and minimum grades, minimum sight distances, maximum degree of curve and related super elevation, and other considerations for thoroughfares are given in Appendix D.

A - Four Lanes Divided with Median - Freeway

Cross-section "A" is typical for four lane divided highways in rural areas that may have only partial or no control of access. The minimum median width for this cross section is 46 feet, but a wider median is desirable.

B - Seven Lanes - Curb & Gutter

Cross section "B" is typically not recommended for new projects. When the conditions warrant six lanes, cross section "D" should be recommended. Cross section "B" should be used only in special situations such as when widening from a five-lane section and right-of-way is limited. Even in these situations, consideration should be given to converting the center turn lane to a median so that cross section "D" is the final cross section.

C - Five Lanes - Curb & Gutter

Typical for major thoroughfares, cross section "C" is desirable where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

D - Six Lanes Divided with Raised Median - Curb & Gutter/ E - Four Lanes Divided with Raised Median - Curb and Gutter

Cross sections "D" and "E" are typically used on major thoroughfares where left turns and intersection streets are not as frequent. Left turns would be restricted to a few selected intersections. The 16 ft median is the minimum recommended for an urban boulevard type cross section. In most instances, monolithic construction should be utilized due to greater cost effectiveness, ease and speed of placement, and reduced future maintenance requirements. In special cases, grassed or landscaped medians result in greatly increased maintenance costs and an increase in danger to maintenance personnel. Non-monolithic medians should only be recommended when the above concerns are addressed.

F - Four Lanes Divided - Boulevard, Grass Median

Cross-section "F" is typically recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 24 ft is recommended with 30 ft being desirable.

G - Four Lanes - Curb & Gutter

Cross section "G" is recommended for major thoroughfares where projected travel indicates a need for four travel lanes but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane would probably be required at major intersections. This cross section should be used only if the above criterion is met. If right-of-way is not restricted, future strip development could take place and the inner lanes could become de facto left turn lanes.

H - Three Lanes - Curb & Gutter

In urban environments, thoroughfares which are proposed to function as one-way traffic carriers would typically require cross section "H".

I - Two Lanes - C&G, Parking both sides: J - Two Lanes - C&G, Parking one side

Cross sections "I" and "J" are usually recommended for urban minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross section "I" would be used on those minor thoroughfares where parking on both sides is needed as a result of more intense development.

K - Two Lanes - Paved Shoulder

Cross section "K" is used in rural areas or for staged construction of a wider multi-lane cross section. On some thoroughfares, projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable period of time. For areas that are growing and future widening will be necessary, the full right-of-way of 100 ft should be required. In some instances, local ordinances may not allow the full 100 ft. In those cases, 70 ft should be preserved with the understanding that the full 70 ft will be preserved by use of building setbacks and future street line ordinances.

L - Six Lanes Divided with Grass Median - Freeway

Cross section "L" is typical for controlled access freeways. The 46 ft grassed median is the minimum desirable median width, but there could be some variation from this depending upon design considerations. Right-of-way requirements would typically vary upward from 228 ft depending upon cut and fill requirements.

M - Eight Lanes Divided with Raised Median - Curb & Gutter

Also used for controlled access freeways, cross section "M" may be recommended for freeways going through major urban areas or for routes projected to carry very high volumes of traffic.

N - Five Lanes/C&G, Widened Curb Lanes; O - Two Lane/Shoulder Section; P - Four Lanes Divided/Raised Median, C&G, Widened Curb Lanes

If there is sufficient bicycle travel along the thoroughfare to justify a bicycle lane or bikeway, additional right-of-way may be required to contain the bicycle facilities. The North Carolina Bicycle Facilities Planning and Design Guidelines should be consulted for design standards for bicycle facilities. Cross sections "N", "O", and "P" are typically used to accommodate bicycle travel.

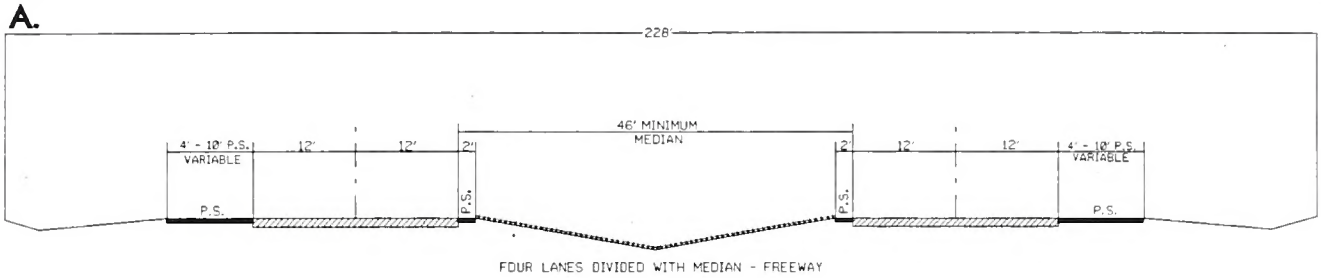
General

The urban curb and gutter cross sections all illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk and the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk farther away from the street to provide additional separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

The right-of-ways shown for the typical cross sections are the minimum right-of-way required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may require either additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.

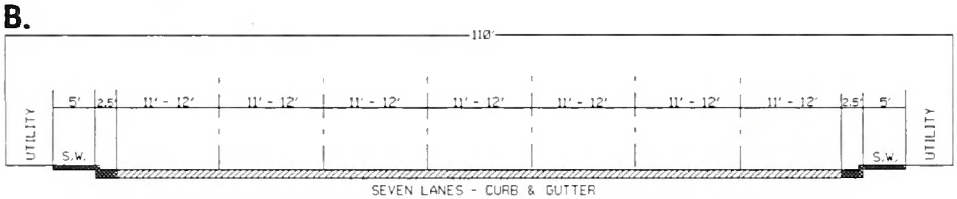
TYPICAL THOROUGHFARE CROSS SECTIONS

A.



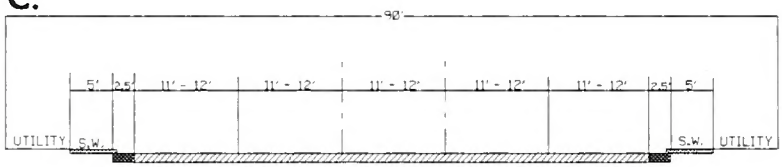
FOUR LANES DIVIDED WITH MEDIAN - FREEWAY

B.



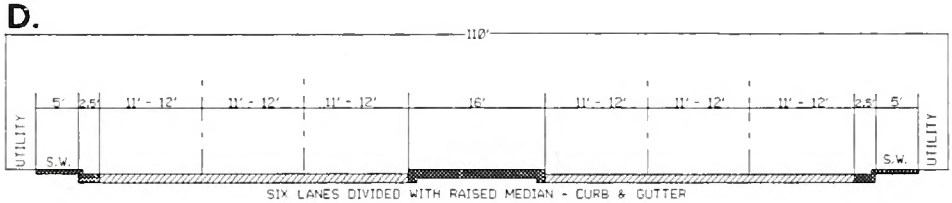
SEVEN LANES - CURB & GUTTER

C.



FIVE LANES - CURB & GUTTER

D.

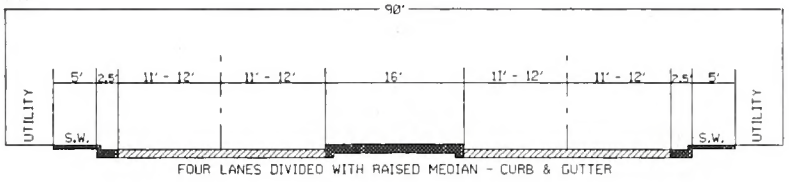


SIX LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

FIGURE C–1

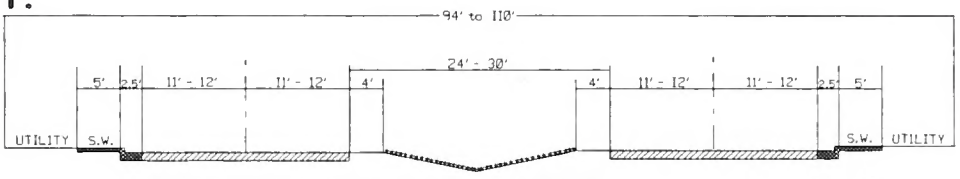
TYPICAL THOROUGHFARE CROSS SECTIONS

E.



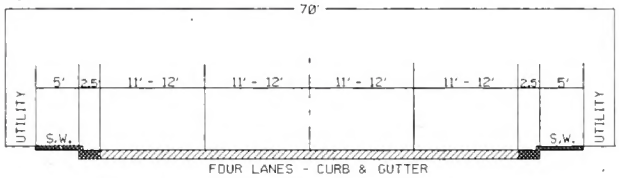
FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

F.



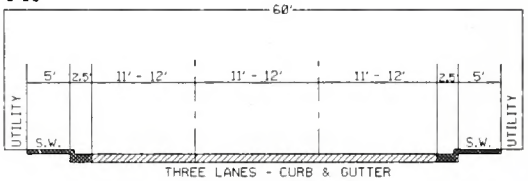
FOUR LANES DIVIDED - BOULEVARD
GRASS MEDIAN

G.



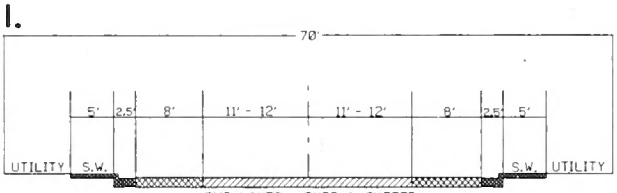
FOUR LANES - CURB & GUTTER

H.



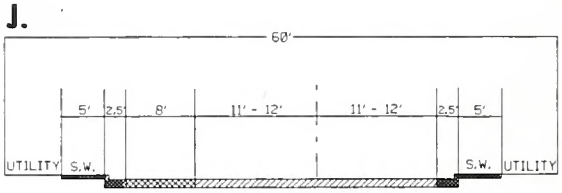
THREE LANES - CURB & GUTTER

I.



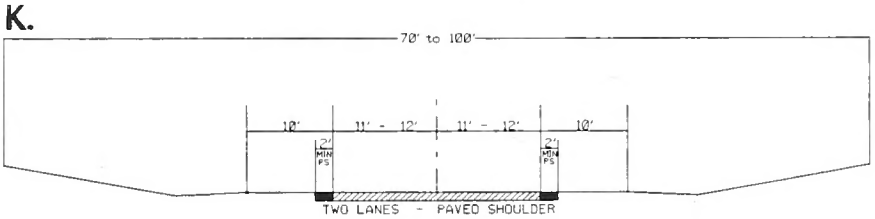
TWO LANES - CURB & GUTTER
PARKING ON EACH SIDE

J.



TWO LANES - CURB & GUTTER
PARKING ON ONE SIDE

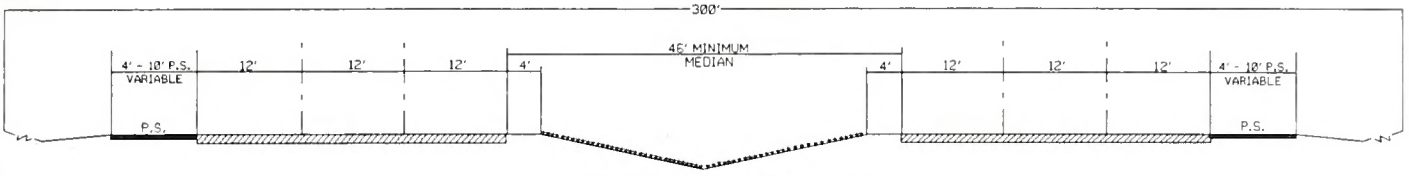
K.



TWO LANES - PAVED SHOULDER

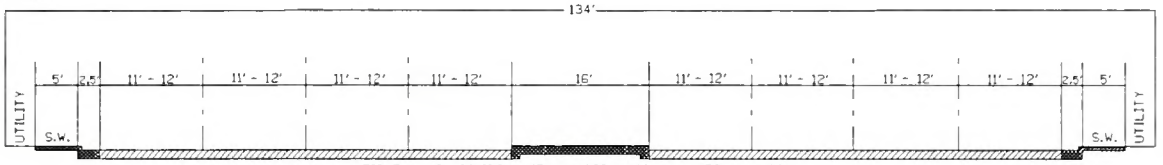
TYPICAL THOROUGHFARE CROSS SECTIONS

L.



SIX LANES DIVIDED WITH GRASS MEDIAN - FREEWAY

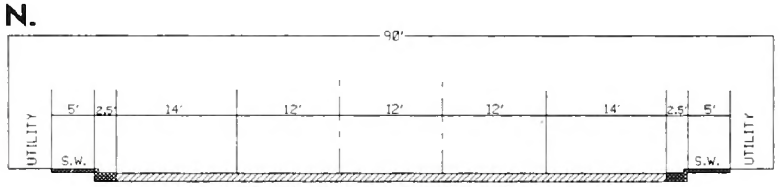
M.



EIGHT LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

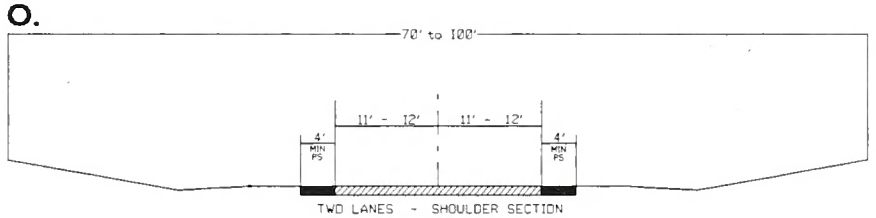
TYPICAL THOROUGHFARE CROSS SECTIONS FOR ACCOMMODATING BICYCLES

N.



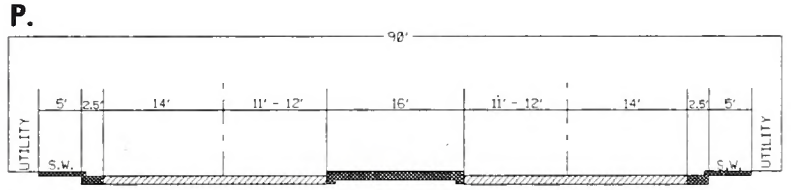
FIVE-LANE ROADWAY WITH CURB & GUTTER,
STANDARD INSIDE LANES & WIDENED CURB LANES

O.



TWO LANES - SHOULDER SECTION

P.



FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER,
STANDARD INSIDE LANES & WIDENED CURB LANES

Appendix D
Recommended Subdivision Ordinances

Definitions

Streets and Roads

Rural Roads

1. *Principal Arterial* - A rural link in a highway system serving travel, and having characteristics indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of interstate routes and other routes designated as principal arterials.

2. *Minor Arterial* - A rural roadway joining cities and larger towns and providing intrastate and intercounty service at relatively high overall travel speeds with minimum interference to through movement.

3. *Major Collector* - A road which serves major intracounty travel corridors and traffic generators and provides access to the arterial system.

4. *Minor Collector* - A road which provides service to small local communities and traffic generators and provides access to the major collector system.

5. *Local Road* - A road which serves primarily to provide access to adjacent land, over relatively short distances.

Urban Streets

1. *Major Thoroughfares* - Major thoroughfares consist of interstate, other freeway, expressway, or parkway roads, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.

2. *Minor Thoroughfares* - Minor thoroughfares perform the function of collecting traffic from local access streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating minor through traffic movements and may also serve abutting property.

3. *Local Street* - A local street is any street not on a higher order urban system and serves primarily to provide direct access to abutting land.

Specific Type Rural or Urban Streets

1. *Freeway, expressway, or parkway* - Divided multilane roadways designed to carry large volumes of traffic at high speeds. A *freeway* provides for continuous flow of vehicles with no direct access to abutting property and with access to selected crossroads only by way of interchanges. An *expressway* is a facility with full or partial control of access and generally

with grade separations at major intersections. A *parkway* is for non-commercial traffic, with full or partial control of access.

2. *Residential Collector Street* - A local street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.

3. *Local Residential Street* - Cul-de-sacs, loop streets less than 2500 feet in length, or streets less than 1.0 miles in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.

4. *Cul-de-sac* - A short street having only one end open to traffic and the other end being permanently terminated and a vehicular turn-around provided.

5. *Frontage Road* - A road that is parallel to a partial or full access controlled facility and provides access to adjacent land.

6. *Alley* - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

Property

1. Building Setback Line - A line parallel to the street in front of which no structure shall be erected.

2. Easement - A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.

3. Lot - A portion of a subdivision, or any other parcel of land, which is intended as a unit for transfer of ownership or for development or both. The word "lot" includes the words "plat" and "parcel".

Subdivision

- Subdivider - Any person, firm, corporation or official agent thereof, who subdivides or develops any land deemed to be a subdivision.

- Subdivision - All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, immediate or future, of sale or building development and all divisions of land involving the dedication of a new street or change in existing streets.

  The following shall not be included within this definition nor subject to these regulations:

  * the combination or re-combination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein,
  * the division of land into parcels greater then 10 acres where no street right-of-way dedication is involved,
  * the public acquisition, by purchase, of strips of land for the widening or the opening of streets, and

* the division of a tract in single ownership whose entire area is no greater than 2 acres into not more than three lots, where no street right-of-way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.

- Dedication - A gift, by the owner, of his property to another party without any consideration being given for the transfer. The dedication is made by written instrument and is completed with an acceptance.

- Reservation - Reservation of land does not involve any transfer of property rights. It constitutes an obligation to keep property free from development for a stated period of time.

Roadway Design Standards

The design of all roads within a planning area shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway & Transportation Officials' (AASHTO) manuals.

The provision of right-of-way for roads shall conform and meet the recommendations of the thoroughfare plan, as adopted by the municipality or county. The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally, the proposed streets should be the extension of existing streets if possible.

Right-of-Way Widths

Right-of-way (ROW) widths shall not be less than the following and shall apply except in those cases where ROW requirements have been specifically set out in the thoroughfare plan.

The subdivider will only be required to dedicate a maximum of 100 feet of ROW. In cases where over 100 feet of right-of-way is desired, the subdivider will be required only to reserve the amount in excess of 100 feet. In all cases in which ROW is sought for a fully controlled access facility, the subdivider will only be required to make a reservation. It is strongly recommended that subdivisions provide access to properties from internal streets, and that direct property access to major thoroughfares, principle and minor arterials, and major collectors be avoided. Direct property access to minor thoroughfares is also undesirable.

A partial width ROW, not less then 60 feet, may be dedicated when adjoining undeveloped property is owned or controlled by the subdivider. This is provided that the width of a partial dedication is such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is sub-divided, the remainder of the full required right-of-way shall be dedicated.

Table D-1

Minimum Right-of-way Requirements

Area Classification	Functional Classification	Minimum ROW
RURAL	Principle Arterial	Freeways- 350 ft Other- 200 ft
	Minor Arterial	100 ft
	Major Collector	100 ft
	Minor Collector	80 ft
	Local Road	60 ft[1]
URBAN	Major Thoroughfare	90 ft
	Minor Thoroughfare	70 ft
	Local Street	60 ft [1]
	Cul-de-sac	variable[2]

[1] The desirable minimum ROW is 60 ft. If curb and gutter is provided, 50 ft of ROW is adequate on local residential streets.

[2] The ROW dimension will depend on radius used for vehicular turn around. Distance from edge of pavement of turn around to ROW should not be less than distance from edge of pavement to ROW on street approaching turn around.

Street Widths

Widths for street and road classifications other than local shall be as recommended by the thoroughfare plan. Width of local roads and streets shall be as follows:

- ***Local Residential***
  - * Curb and Gutter section: 26 feet, face to face of curb
  - * Shoulder section: 20 feet to edge of pavement, 4 feet for shoulders

- ***Residential Collector***
  - * Curb and Gutter section: 34 feet, face to face of curb
  - * Shoulder section: 20 feet to edge of pavement, 6 feet for shoulders

Geometric Characteristics

The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under the 'Right-of-Way Widths' section shall apply.

1. *Design Speed* - The design speed for a roadway should be a minimum of 5 mph greater than the posted speed limit. The design speeds for subdivision type streets are shown in Table D-2.

2. *Minimum Sight Distance* - In the interest of public safety, no less than the minimum sight distance applicable shall be provided. Vertical curves that connect each change in grade shall be provided and calculated using the parameters set forth in Table D-3.

3. *Superelevation* - Table D-4 shows the minimum radius and the related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter is 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.

4. *Maximum and Minimum Grades* - The maximum grades in percent are shown in Table D-5. Minimum grade should not be less then 0.5%. Grades for 100 feet each way from intersections (measured from edge of pavement) should not exceed 5%.

Table D-2

Design Speeds

Facility Type	Design Speed (mph) Desirable	Minimum Level	Minimum Rolling
RURAL			
Minor Collector Roads (ADT Over 2000)	60	50	40
Local Roads[1] (ADT Over 400)	50	*50	*40
URBAN			
Major Thoroughfares[2]	60	50	40
Minor Thoroughfares	40	30	30
Local Streets	30	**30	**20

Note: *Based on ADT of 400-750. Where roads serve a limited area and small number of units, can reduce minimum design speed. **Based on projected ADT of 50-250. (Reference NCDOT Roadway Design Manual page 1-1B)

[1] Local Roads including Residential Collectors and Local Residential.

[2] Major Thoroughfares other than Freeways or Expressways.

Table D-3

Sight Distance

Design Speed (mph)	Stopping Sight Distance (feet)		Minimum K[1] Values (feet)		Passing Sight Distance (feet)
	Desirable	Minimum	Crest Curve	Sag Curve	For 2-lanes
30	200	200	30	40	1100
40	325	275	60	60	1500
50	475	400	110	90	1800
60	650	525	190	120	2100

Note: General practice calls for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case. (Reference NCDOT Roadway Design Manual page 1-12 T-1)

[1]K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length of the vertical curve, which will provide the desired sight distance. Sight distance provided for stopped vehicles at intersections should be in accordance with "A Policy on Geometric Design of Highways and Streets, 1990".

Table D-4

Superelevation

Design Speed (mph)	Minimum Radius of Maximum e[1]			Maximum Degree of Curve		
	e=0.04	e=0.06	e=0.08	e=0.04	e=0.06	e=0.08
30	302	273	260	19 00'	21 00'	22 45'
60	573	521	477	10 00'	11 15'	12 15'
80	955	955	819	6 00'	6 45'	7 30'
100	1,637	1,432	1,146	3 45'	4 15'	4 45'

[1] e = rate of roadway superelevation, foot per foot

Note: (Reference NCDOT Roadway Design Manual page 1-12 T-6 thru T-8)

Table D-5

Maximum Vertical Grade

Facility Type and Design Speed (mph)	Minimum Grade in Percent		
	Flat	Rolling	Mountainous
RURAL			
Minor Collector Roads*			
20	7	10	12
30	7	9	10
40	7	8	10
50	6	7	9
60	5	6	8
70	4	5	6
Local Roads*[1]			
20	-	11	16
30	7	10	14
40	7	9	12
50	6	8	10
60	5	6	-
URBAN			
Major Thoroughfares[2]			
30	8	9	11
40	7	8	10
50	6	7	9
60	5	6	8
Minor Thoroughfares*			
20	9	12	14
30	9	11	12
40	9	10	12
50	7	8	10
60	6	7	9
70	5	6	7
Local Streets*			
20	-	11	16
30	7	10	14
40	7	9	12
50	6	8	10
60	5	6	-

Note: *For streets and roads with projected annual average daily traffic less than 250 or short grades less than 500 ft long, grades may be 2% steeper than the values in the above table.
(Reference NCDOT Roadway Metric Design Manual page 1-12 T-3)

[1] Local Roads including Residential Collectors and Local Residential.

[2] Major Thoroughfares other than Freeways or Expressways.

Intersections

1. Streets shall be laid out so as to interest as nearly as possible at right angles, and no street should intersect any other street at an angle less than sixty-five (65) degrees.

2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.

3. Offset intersections are to be avoided. Intersections that cannot be aligned should be separated by a minimum length of 200 feet between survey centerlines.

Cul-de-sacs

Cul-de-sacs shall not be more than 500 feet in length. The distance from the edge of pavement on the vehicular turn around to the right-of-way line should not be less than the distance from the edge of pavement to right-of-way line on the street approaching the turn around. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provisions are mode for service access. Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.

2. The width of an alley shall be at least 20 feet.

3. Dead-end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turn around as may be required by the planning board.

Permits for Connection to State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at the office of the District Engineer of the Division of Highways.

Offsets To Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 30 feet form the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 6 feet from the face of curb.

Wheel Chair Ramps

All street curbs being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason, shall provide wheelchair ramps for the physically handicapped at intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

Horizontal Width on Bridge Deck

The clear roadway widths for new and reconstructed bridges serving two-lane, two-way traffic should be as follows:

- shoulder section approach:
    * under 800 ADT design year - minimum 28 feet width face to face of parapets, rails, or pavement width plus 10 feet, whichever is greater,
    * 800 - 2000 ADT design year - minimum 34 feet width face to face of parapets, rails, or pavement width plus 12 feet, whichever is greater,
    * over 2000 ADT design year - minimum width of 40 feet, desirable width of 44 feet width face to face of parapets or rails;

- curb and gutter approach:
    * under 800 ADT design year - minimum 24 feet face to face of curbs,
    * over 800 ADT design year - width of approach pavement measured face to face of curbs,
    * where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face curbs, and in crown drop; the distance from face of curb to face of parapet or rail shall be a minimum of 1.5 feet, or greater if sidewalks are required.

The clear roadway widths for new and reconstructed bridges having 4 or more lanes serving undivided two-way traffic should be as follows:

- shoulder section approach - width of approach pavement plus width of usable shoulders on the approach left and right. (shoulder width 8 feet minimum, 10 feet desirable)
- curb and gutter approach - width of approach pavement measured face to face of curbs.

Appendix E

Planning Area Housing and Employment Data

Zone	1996 Employment	2025 Employment	1996 Housing	2025 Housing
1	1	1	16	42
2	48	43	46	52
3	5	61	25	74
4	9	110	26	36
5	1	1	16	21
6	0	0	13	23
7	6	6	12	27
8	1	5	10	20
9	6	5	14	24
10	54	63	29	44
11	0	0	18	33
12	5	5	17	37
13	31	65	7	7
14	62	60	30	30
15	218	217	41	41
16	0	0	7	32
17	0	0	15	15
18	0	0	7	17
19	16	22	56	56
20	75	70	24	34
21	8	7	20	40
22	0	0	21	31
23	60	81	2	2
24	0	0	20	40
25	3	3	30	65
26	65	74	0	0
27	9	15	77	85
28	0	0	9	9
29	2	2	20	50
30	29	32	10	10
31	18	18	107	107
32	2	2	9	34
33	0	0	18	33
34	12	119	13	33
35	0	0	12	22
36	48	55	0	0
37	16	19	33	33
38	1	6	24	24
39	252	238	106	120
40	0	0	55	79
41	2	2	20	20

Appendix E Continued

Planning Area Housing and Employment Data

Zone	1996 Employment	2025 Employment	1996 Housing	2025 Housing
42	0	0	5	20
43	0	0	31	56
44	0	5	4	19
45	1	1	16	16
46	30	38	246	256
47	0	4	2	17
48	1	1	28	43
49	6	5	22	31
50	1	1	25	54
51	0	0	31	41
52	1	1	12	22
53	6	8	9	14
54	0	9	5	20
55	13	21	12	14
56	0	0	6	26
57	0	0	39	49
58	1	1	7	17
59	1	1	19	24

Appendix F
Pedestrian Policy Guidelines

These guidelines provide a procedure for implementing the Pedestrian Policy adopted by the Board of Transportation in August 1993. The pedestrian Policy addresses TIP projects and makes an important distinction between "considering the needs of pedestrians to avoid creating hazards to pedestrian movements" and the concept of "facilitating pedestrian movements for other reasons."

Hazards

A hazard in this context is defined as a situation when pedestrian movements are physically blocked in a manner which forces pedestrians to use another mode of transportation or walk in an automobile traffic lane (parallel with the automobile traffic) to pass a barrier. The concept of "not creating a hazard" is intended to allow municipalities to have the flexibility to add pedestrian facilities as part of the project, or in the future after the TIP project is complete. Our current standard cross sections generally do not create barriers for pedestrian movements. One exception is on urban bridges where the bridge rail is at the back of the curb.

Quantifying the need for Pedestrian Facilities

Planning studies should evaluate the need for pedestrian facilities based on the degree to which the following criteria are met.

1. Local Pedestrian Policy
2. Local Government Commitment
3. Continuity and Integration
4. Locations
5. Generators
6. Safety
7. Existing or Projected Pedestrian Traffic

Requirements for DOT Funding

Replacing Existing Sidewalks

The DOT will pay 100% of the cost to replace an existing sidewalk that is removed to make room for a widening project.

Preventing Hazards

If there is evidence that a TIP project would create a hazard to existing pedestrian movements, the DOT will take the initiative not to create the hazard. However, if there is not evidence that a TIP project would create a hazard to existing pedestrian movements, the municipality will need to prove that there will be pedestrian movements, which would be affected within five years by the hazard created by the TIP project.

Incidental Projects

Due to the technical difficulty of describing justification for pedestrian facilities, the committee chose a cost sharing approach to provide cost containment for the pedestrian facilities. The DOT may share the incremental cost of constructing the pedestrian facilities if the "intent of the criteria" is met. The DOT will pay a matching share of incidental pedestrian facility total construction costs up to a cap of no more than 2% of total project construction cost. The matching share is a sliding scale based on population as follows:

Table F-1

Incidental Projects Cost Participation Break Down

Municipal Population	Participation	
	DOT	Local
> 100,000	50%	50%
50,000 to 100,000	60%	40%
10,000 to 50,000	70%	30%
< 10,000	80%	20%

Funding Caps

Under normal circumstances, the cumulative funding for preventing hazards and providing incidental pedestrian facilities should not exceed 2% of the total project construction cost.

Independent Projects

The DOT will have a separate category of money for all independent pedestrian facility projects in North Carolina. The independent pedestrian facility funds will be administered similar to the Bicycle Program.

Right-of-Way

In general, municipalities are responsible for providing any right-of-way needed to construct pedestrian facilities. However, the 8-foot berm the DOT generally provides on urban curb and gutter facilities can accommodate pedestrian facilities.

Maintenance

Local governments will be responsible for maintaining all pedestrian facilities.

For further information about the Pedestrian Policy Guidelines please contact the following:

Statewide Planning Branch
NC Department of Transportation
1554 Mail Service Center
Raleigh, NC 27699
(919) 733-4705

Appendix G
Transportation Improvement Program
Project Process

The process for requesting projects to be included in the Transportation Improvement Program (TIP) is described briefly in this appendix.

The local representatives should first decide which projects from the thoroughfare plan they would like funded in the TIP. A TIP request for a few carefully selected projects is likely to be more effective than requesting all the projects proposed in the thoroughfare plan. These projects should be prioritized by the local representatives and summarized briefly, as shown on Appendix Page G-3.

After determining which projects are the highest priority for the area, a TIP project request should be sent to the Board of Transportation Member from the municipality's or county's respective district. The TIP project request should include a letter with a prioritized summary of requested projects, as well as a TIP candidate project request form and a project location map for each project. An example of each of these items is included in this appendix.

Example

* *Note: This is not an official request submitted to the Board of Transportation. This is intended to be an example of a Transportation Improvement Program (TIP) Request.*

Month ##, Year

North Carolina Board Member
N. C. Board of Transportation
N. C. Department of Transportation
P. O. Box 25201
Raleigh, NC 27611-5201

Dear Board Member:

SUBJECT: 2000-2006 TIP Project Requests for *Generic City*

Enclosed find the projects requested by *Generic City* for consideration in the next TIP update. The list is presented by priority, as approved by the *Generic City* Council at their *Month* meeting.

Generic City also endorsed the existing schedule of projects contained in the current TIP for the city, with one request. The City requests that TIP Project R-*XXXX* remain as a high priority and kept on the existing schedule.

We thank you for the opportunity to participate in development of the State TIP. Please contact us immediately if additional information is needed concerning any of the enclosed project requests.

Sincerely,

John Q. Public

cc: Division Engineer
Enclosure

Generic City
City Council
2000 Proposed Highway Projects (Final)

1) **SR 1111 (Town Street) & SR 1112 (Industry Drive) TIP Project R-XXXX**
   - From SR 1113 (Country Road) to NC 11
   - Widen roadway to a multilane facility, with some new location

2) **US 11**
   - From SR 1112 (Industry Drive) to SR 1113 (Country Road)
   - Widen roadway to a multilane facility

3) **NC 11**
   - From SR 1114 (Any Road) to the existing four lane section just south of I-85
   - Widen roadway to a multilane facility

4) **US 11 Business (Business Road)**
   - From SR 1115 (Some Road) to NC 12
   - Widen facility to a five lane cross section

5) **New Connector**
   - From US 11 to US 112 Business (City Street)
   - New Facility

Highway Program
TIP Candidate Project Request

(Please Provide Information if Available)

Date *##/##/##* Priority No. *#*

County *Generic* City/Town *Generic*

Requesting Agency *Generic City Council* NCTIP No. *R-####* (if available)

Route (US, NC, SR/Local Name) *SR 1111(Town Street) and SR 1112(Industry Drive)*

Project Location (From/To/Length) *From SR 1113 (Country Road) to NC 11, #.# miles*

Type of Project (Widening, New Facility, Bridge Replacement, Signing, Safety, Rail Crossing, Bicycle, Enhancement, etc.)
Widen roadway to a multi-lane facility, with some new location.

Existing Cross Section *24* Feet, Type

Existing Row *60 to 80* Feet Existing ADT *8,000 (1997)*

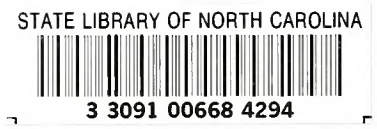
Estimated Cost, ROW $ *900,000* Construction $ *4,000,000*

Brief Justification for Project *As a major thoroughfare, this facility carries increasing traffic volumes between the industial sites along this route to NC 11 and the I-85 corridor. In the adopted thoroughfare plan for Generic City, it is recommended that this facility should be widened to a multi-lane cross section due to the increasing volume and the potential for more development in this area. The City requests that this project continue to be funded.*

Project Supported By (Agency/Group)

Other Information/ Justification

- ☒ Part of Thoroughfare Plan
- ☐ Part of Comprehensive Plan
- ☐ Serves School
- ☐ Serves Hospital
- ☐ Obsolete Facility
- ☐ Serves Park
- ☐ High Accident (#)
- ☐

(Please Attach Map Showing Project Location)

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